Catalogue 15-204E Annual

System of National Accounts

Aggregate Productivity Measures

1991

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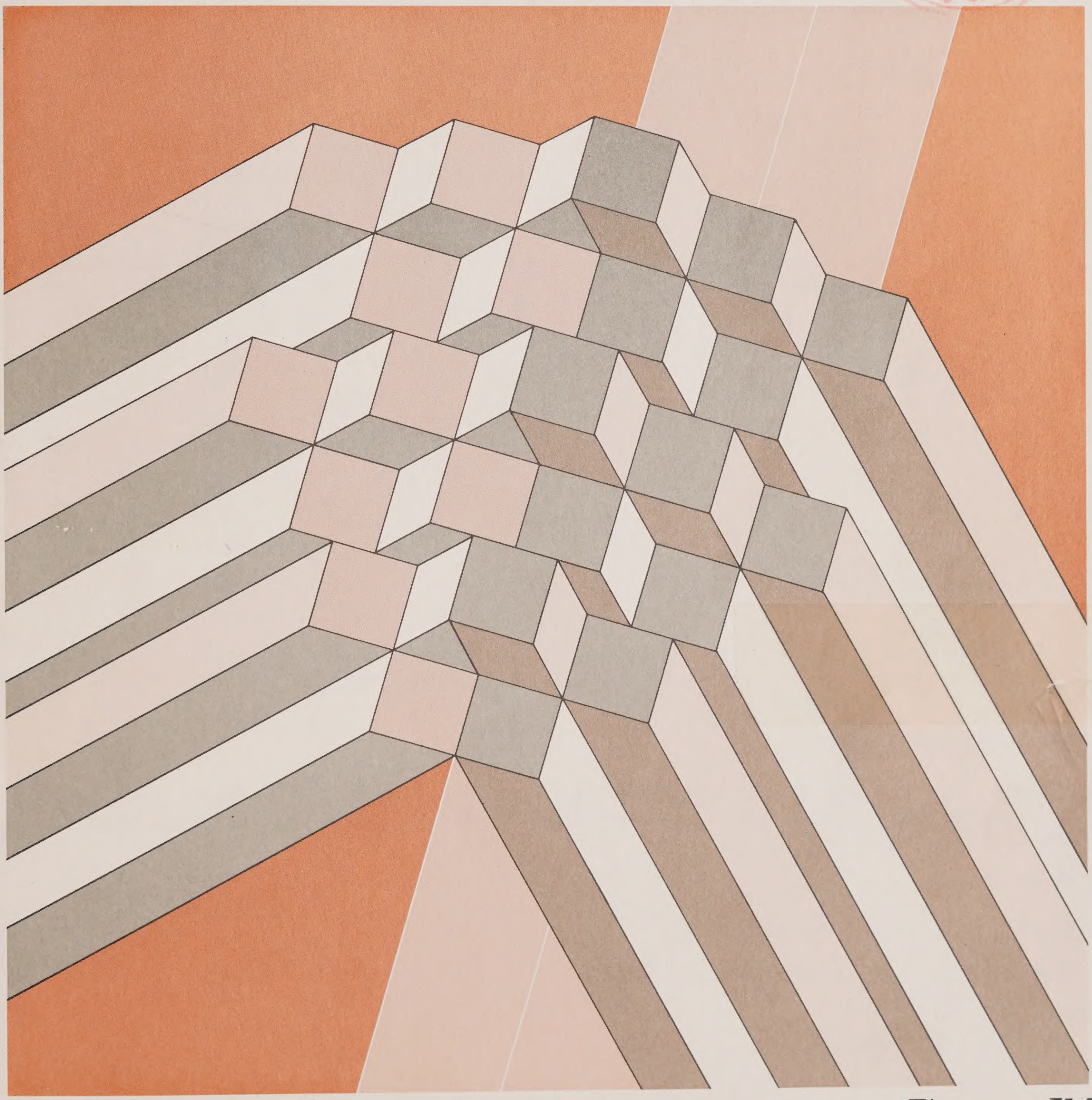
Feature Articles:

- Canada–U.S. Comparisons
- Multifactor Productivity based on Hours Worked



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.. figures not available.

... figures not appropriate or not applicable.

- nil or zero.

-- amount too small to be expressed.

p preliminary figures.

r revised figures.

x confidential to meet secrecy requirements of the Statistics Act.

Contributors

This publication was produced under the direction of Claude Simard, Director, René Durand, Assistant Director and Aldo Diaz, Chief of the Productivity Section, Input-Output Division.

Tables, Graphs & Composition: N. Richer, M. Allard-Saulnier, V. Clarke

Coordination: M. Allard-Saulnier, M. Larose

Data Analysis and Development: J.-P. Maynard, M. Allard-Saulnier, M. Larose

Data Processing: S. Burrows, V. Clarke, M. Larose

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The System of National Accounts

In Canada, the National Accounts have been developed since the close of the Second World War in a series of publications relating to their constituent parts. These have now reached a stage of evolution where they can be termed a "System of National Accounts". For purposes of identification, all publications (containing tables of statistics, descriptions of conceptual frameworks and descriptions of sources and methods) which make up this System carry the term "System of National Accounts" as a general title.

The System of National Accounts in Canada consists of several parts. The annual and quarterly Income and Expenditure Accounts (included with Catalogue Nos. carrying the prefix 13) were, historically speaking, the first set of statistics to be referred to with the title "National Accounts" (National Accounts, Income and Expenditure). The Balance of International Payments data (Catalogue Nos. with prefix 67), are also part of the System of National Accounts and they, in fact, pre-date the Income and Expenditure Accounts.

Greatly expanded structural detail on industries and on goods and services is portrayed in the Input-Output Tables of the System (Catalogue Nos. with prefix 15). The Catalogue Nos. carrying the prefix 15 also provide measures of the contribution of each industry to total Gross Domestic Product at factor cost as well as Productivity Measures.

Both the Input-Output tables and estimates of Gross Domestic Product by industry use the establishment as the primary unit of industrial production. Measures of financial transactions are provided by the Financial Flow Accounts (Catalogue Nos. with prefix 13). Types of lenders and financial instruments are the primary detail in these statistics and the legal entity is the main unit of classification of transactors. Balance sheets of outstanding assets and liabilities are published annually.

The System of National Accounts provides an overall conceptually integrated framework in which the various parts can be considered as interrelated sub-systems. At present, direct comparisons amongst those parts which use the establishment as the basic unit and those which use the legal entity can be carried out only at highly aggregated levels of data. However, Statistics Canada is continuing research on enterprise-company-establishment relationships; it may eventually be feasible to reclassify the data which are on one basis (say the establishment basis) to correspond to the units employed on another (the company or the enterprise basis).

In its broad outline, the Canadian System of National Accounts bears a close relationship to the international standard as described in the United Nations publication: A System of National Accounts (Studies in Methods, Series F, No. 2 Rev. 3, Statistical Office, Department of Economic and Social Affairs, United Nations, New York, 1968).

Notes to Users

Productivity estimates reported in this publication have been the subject of the following improvements:

1. In addition to the multifactor productivity estimates which are based on employment as the measure of labour input, multifactor productivity estimates based on hours worked have now been developed and are presented for the first time in this issue. A feature article in this publication describes the sources, concepts, and methods used to develop the estimates of hours worked and analyses the impact of the new measure of labour input on multifactor productivity estimates.

2. Employment growth estimates for the total economy used in labour and multifactor productivity measures have been reconciled with the total employment growth from the Labour Force Survey for the years 1988 through 1991.

3. Multifactor productivity estimates are now available for 110 industries instead of 109 as a result of the development of separate productivity estimates for the retail trade and wholesale trade industries.

4. Capital stock estimates used in the calculation of multifactor productivity have been revised to reflect new estimates of asset lives. Capital stock estimates now fully incorporate the average asset lives from five annual surveys taken from 1985 to 1989. The previous capital stock series only reflected the results of the first three years of the survey. As the capital stock series are based on an interpolation of asset lives between the 1947 survey estimates and the more recent survey results, the change from the three-year to the five-year average therefore has an impact on the capital stock series over the entire time period.

5. In last year's issue of *Aggregate Productivity Measures*, comparisons with the United States productivity estimates were not made because of upcoming major revisions in the American statistics. Revisions to the estimates for the major sectors of the economy are still in process and so major sector comparisons are still not possible at this time. However, this year, comparisons with the United States multifactor productivity estimates for detailed manufacturing industries are presented in a feature article in this publication. As the U.S. estimates used in the study are not based on the same data sources as the major sector measures, they will not be affected by the upcoming revisions.

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Introduction

This is the second issue of the *Aggregate productivity Measures* publication for the year 1991. During the course of the year, many important changes were brought to the multifactor productivity program. The main purpose of this second issue is to present multifactor productivity estimates based on hours worked instead of persons at work. Hours worked have now been estimated at the lowest level of aggregation of the multifactor productivity database since 1961 and are available upon request.

In addition, this issue includes preliminary estimates for 1990 and 1991 which have been the subject of revisions since the last issue. More complete estimates are now available for 1989 as preliminary estimates of the input-output tables have been released for that year. Revised input-output tables for 1988 also became available, resulting in revisions to both labour and multifactor productivity estimates for that year.

This issue contains two feature articles. The first presents the results of a study on the comparability of two-digit manufacturing multifactor productivity estimates for Canada and the United States. The regular comparative analysis of large aggregate productivity estimates for Canada and United States is still not possible pending U.S. revisions. These revisions will not affect the two-digit manufacturing comparisons as the estimates at this level of aggregation are not based on the same data sources as the large aggregates. A second feature article reports on sources, concepts and methods associated with the new estimates of hours worked. Until now, Canadian multifactor productivity estimates were based on persons at work as the measure of labour input whereas the U.S. estimates were based on hours worked. The development of Canadian multifactor productivity estimates based on hours worked, therefore, not only improves the quality of the estimates, but it eliminates one difference between Canadian and U.S. multifactor productivity measures.

As usual, Part 1 of the publication presents the labour productivity estimates while Part 2 presents the experimental multifactor productivity indices for the business sector of the Canadian economy. This is the fourth release of the multifactor productivity estimates. Readers who are not familiar with multifactor productivity measures would benefit from reading the accompanying technical appendices as they explain the basic concepts needed to interpret the statistical tables. In particular, Appendix 1 in Part 2 describes several multifactor productivity measures. All of these multifactor productivity measures use the same mathematical formula but they differ with respect to the outputs and the inputs to which they are applied. Distinct productivity measures are defined for industries, groups of industries, groups of commodities, and for the aggregate business sector.

Multifactor productivity estimates, while coming closer to measuring efficiency gains than labour productivity does, are not exempt of problems of their own. Productivity estimates, in principle, measure increases in efficiency associated with technical progress and economies of scale but, in practice, they also reflect the impact of various factors associated in particular with cyclical fluctuations as well as many potential biases due to errors in the data. For instance, some inputs are not accounted for. This is presently the case with natural resources whose quantity and quality, which are not yet available, are potentially crucial for primary industries' productivity estimates. This explains why productivity estimates for important industries such as forestry and mining are not made available at the present time. As research on the measurement of these resources proceeds, more primary industry estimates will be published.

Similarly, productivity estimates for several service industries show unsatisfactory results for many possible reasons, one of which is the deflation of their output. Their productivity estimates are withheld until further progress is made on that front. Over-deflation of output in service industries on the basis of input prices, as is often the case, leads to an underestimation of productivity growth. To the extent that service industries supply goods-producing industries, the service inputs of the latter are underestimated. This tends to create an upward bias in the productivity gains of the goods-producing industries. At the aggregate level, these biases tend to cancel out (provided that final sales of services are not biased) as aggregate productivity relates only to final demand deliveries which are net of intermediate inputs.

Estimates for other industries include biases which have changed over the historical period as the methods used to estimates their outputs and inputs have changed. For example, the output in construction industries has generally been deflated with an average of input prices before 1971, therefore limiting productivity gains in those industries. After 1971, several construction activities have been deflated with more appropriate price indices, contributing to an improvement of their productivity estimates. Still, further progress is needed in the measurement of output deflators for construction industries.

FOR FURTHER READING

Selected publications from Statistics Canada

The labour and multifactor productivity indexes presented in this publication are obtained mainly from a set of integrated industry and commodity statistics within the System of National Accounts (SNA). The integration ensures consistency of definition over time and across industry and commodity classifications and the information may therefore differ from other Statistics Canada data. Publications with a catalogue number prefix 15 contain SNA integrated data and are available under the following titles:

- Gross Domestic Product by Industry, cat. 15-001.
- The Input-Output Structure of the Canadian Economy, cat. 15-201.
- The Input-Output Structure of the Canadian Economy in Constant Prices, cat. 15-202.
- The Input-Output Structure of the Canadian Economy, 1961-81, cat. 15-510, occasional.
- The Input-Output Structure of the Canadian Economy in Constant Prices, 1961-81, cat. 15-511, occasional.

Highlights

Recent productivity and unit labour cost developments in Canada have raised some concerns about Canadian competitiveness, in particular with respect to its largest trading partner, the United States. The various measures presented in this publication, such as labour productivity, multifactor productivity, unit labour cost and labour compensation, represent key indicators of competitiveness. The following overview focuses on these measures, bringing together the information they provide to describe trends in productive efficiency in Canada since 1961 and in particular, during the last two business cycles. The last section will then turn to comparative productivity developments in Canadian and American manufacturing industries, where competitiveness is paramount because of the importance of international trade in this area.

Labour Productivity Measures

Preliminary estimates of labour productivity in the business sector, as measured by GDP per person-hour, indicate a 1.8% growth in 1991. This is a noticeable comeback compared to the 1.2% decline in 1990.

The fall in labour productivity experienced by the business sector in 1990 occurred mainly in services industries, with the exception of the communications industries, where productivity growth continues to be strong. However, service industry labour productivity resumed its growth in 1991, posting a rate of 1.4%.

Preliminary estimates indicate that labour productivity in manufacturing industries is showing continued improvement in comparison to 1989, growing by 0.9% in 1990 and by 1.3% in 1991. This rise in labour productivity occurred at a time when manufacturing industries were faced with weakening demand. The estimates show that manufacturing industries reduced both employment and hours rapidly to adjust to a decreasing demand.

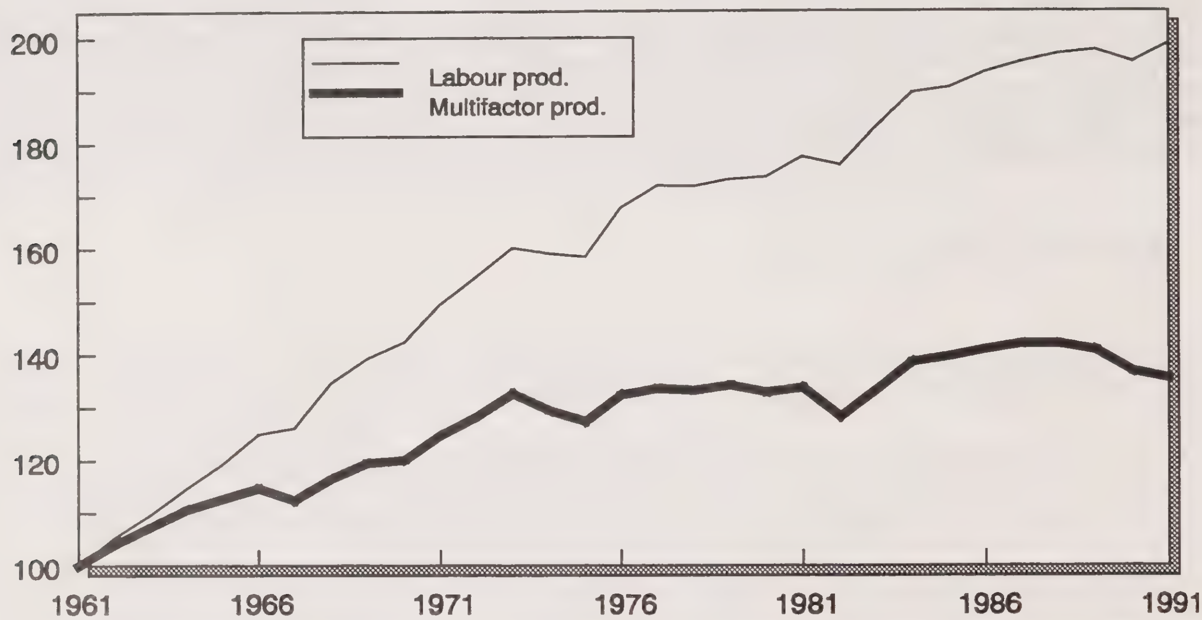
Over the 1982-1991 economic cycle, business sector labour productivity grew by an average annual rate of 1.4%. This increase is comparable to the average rate of 1.5% measured over the 1975-1982 cycle, yet it is much weaker than the rate of 3.3% observed over the 1961 to 1975 period. In manufacturing, the average annual increase of 2.2% in productivity from 1982 to 1991 was stronger than the increase from 1975 to 1982 (1.5%). However, it was much weaker than the 3.7% growth observed over the 1961-1975 period. Over the current cycle, labour productivity growth in manufacturing industries has been stronger than that of the total business sector and of services industries. Despite this improvement in manufacturing, business sector productivity growth shows a persistent decrease over the long term.

Economic performance as measured by labour productivity must however be interpreted carefully as these estimates reflect changes in the capital-labour ratio in addition to the growth in productive efficiency. When the capital-labour ratio increases, that is, when the relative contribution of capital to output growth increases, labour productivity grows faster than multifactor productivity and vice-versa. Over the last two business cycles, there was a deceleration in the rate of growth of productive capital stock from an average growth of 4.5% in 1975-1982 to 2.4% in 1982-1991, while employment grew at the same pace as before (1.8% versus 1.9%). As a result, the growth rate of the capital-labour ratio shrunk from an average of 2.6% in 1975-1982 to only 0.6% in 1982-1991 bringing the two productivity growth rates closer together in this period. However, for most of the past thirty years, the capital-labour ratio has increased, causing labour productivity to grow faster than multifactor productivity, as can be seen in figure 1. To assess Canada's

performance, it is therefore more relevant to look at changes in multifactor productivity estimates as this measure reflects more accurately the efficiency with which commodities are produced.

Figure 1

Labour productivity and multifactor productivity indices for the Canadian business sector, 1961-1991



Multifactor Productivity Measures

In 1991, the productivity outlook was worse when looking at the multifactor measure[1] than when considering labour productivity. In fact, preliminary estimates indicate that business sector multifactor productivity fell for three consecutive years, in 1989 (-0.8%), in 1990 (-2.8%), and in 1991 (-1.0%) as the economy reached the end of a long expansionary cycle that began in 1982. Such a fall in productivity is characteristic of all business cycle downturns. The decline in multifactor productivity was more gradual than was the case during the last recession when it dropped by 4.1% in 1982 and bounced back the following year.

Capital stock grew at a stronger pace in 1989, 1990, and 1991 as a result of strong investments undertaken towards the end of the long expansion period. When these investments translated into a larger capital stock, the economy had already started to slow down; the new assets therefore added to the excess capacity. In fact, capital stock has been growing faster than GDP in real terms since 1989. On the other hand, person-hours have been growing slower than real output for most of the 1980s, except in 1990 when

[1] *Multifactor productivity measures based on hours worked as the measure of labour input are presented for the first time in this publication. These measures reflect changes in productive efficiency more accurately than multifactor productivity based on employment as average hours worked have declined through time. An article in this publication describes the methodology used to develop the estimates of person-hours and analyses the impact of the new measure of labour input on multifactor productivity estimates.*

the drop in real production was sharper than that of hours worked. This explains the fall in multifactor productivity as well as the gap between this measure and the labour productivity measure. In 1982, the growth of capital stock was also remarkably strong (at 7.0%) but the recovery in 1983 was strong enough to return productivity to positive growth rates. Productivity may be expected to regain its strength in the coming years, when the economy returns to higher capacity utilization rates.

Although multifactor productivity in manufacturing industries has grown more over the present business cycle than either service industries or the business sector, most of the increase took place during the initial years of expansion. In the last four years, manufacturing productivity experienced sharper annual declines than the overall business sector. This is attributable to manufacturing industries having invested in fixed capital at a much greater rate than non-manufacturing industries and having experienced a slower output growth in 1989 and a more severe decline in output in 1990 and 1991.

As Canada's competitiveness and future prosperity are among the top concerns in many circles, more than ever, Canada's performance must be assessed from an international perspective. As emphasized in last year's highlights, manufacturing industries are an important group in the economy in terms of their contribution to total business sector productivity. Moreover, it is particularly subject to international competition as Canadian trade consists mostly of trade in manufactured goods. In the next section, the overview of the manufacturing industries will therefore be done in comparative terms with their U.S. counterparts.

Multifactor Productivity Growth in Canadian Manufacturing Industries Relative to the United States

i - Aggregate Trends

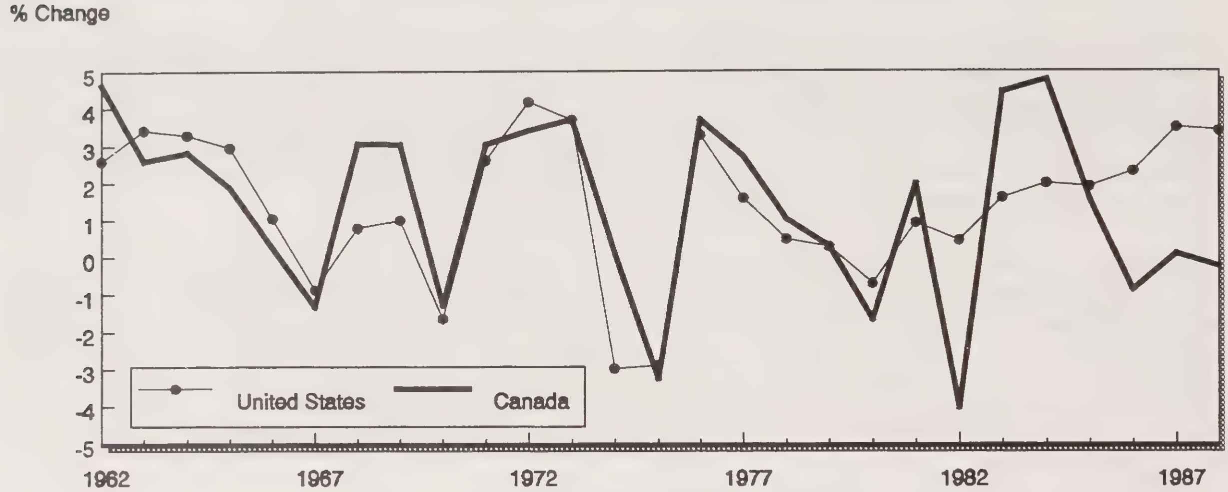
Over the 1961 to 1988[2] period, multifactor productivity growth based on gross output net of intra-industry sales in Canadian and American manufacturing industries exhibited very similar trends. The United States manufacturing industries posted a marginally higher average annual growth rate over the twenty seven year period at 1.4%, compared with Canadian manufacturing at 1.3%. The difference, however, may not be significant given the normal range of uncertainty surrounding any estimate. Behind this seemingly comparable long-term performance of total manufacturing in Canada and the U.S lie many differences across industries and through time that must be examined in order to gain a better understanding of the situation.

Manufacturing industries in the United States had a comparatively poorer performance than in Canada in the pre-1975 period, exhibiting a weaker productivity growth than their long-term average. Although the recession of the mid-70s appears to have inflicted a more severe blow to manufacturing productivity in the United States compared to Canada, productivity growth reached the same peak in both countries during the subsequent recovery. In contrast, multifactor productivity declined much more in Canada than in the United States during the 1982 recession, resulting in a stronger 1975-1982 average annual growth of 0.9% in the United States compared with a 0.5% average growth in Canada. Although the initial recovery was more vigorous in Canada, the United States' average annual productivity performance in the 1980s exceeded that of Canada by almost a full percentage point. In particular, since 1985, Canada's manufacturing multifactor productivity has exhibited slower growth in comparison to its southern neighbour as can be seen in figure 2.

[2] *The last year for which this comparison is possible is 1988 due to U.S. data availability.*

Figure 2

Multifactor Productivity Growth in Canadian and U.S. Manufacturing Industries, 1962-1988



These findings are consistent with the history of business cycles in the two countries as the United States experienced a more severe and prolonged recession in the mid-70s compared to Canada whereas Canada's economy took a much more severe blow in 1982 compared to the United States.

In brief, if we consider the 1961-1988 annual average growth as the norm, Canada's manufacturing productivity did return to "normal" rates of growth after the 1982 recession but comparatively, the United States has experienced greater than "normal" productivity gains over the same period.

ii - Comparative Performance of Individual Industries

Over the 1961-1988 period, Canada's multifactor productivity grew at a relatively faster pace than that of the United States in nine of the thirteen manufacturing industries for which estimates are comparable. In most cases however, as shown in Text table 1, the difference in growth rates is marginal. The two largest average growth differentials in favour of Canada were found in the primary metal industries and in printing, publishing & allied industries. During this period, Canada lagged behind in four industries: by an average of 1.2 percentage points in the machinery, electrical and electronic group, by an average of 0.9 point in the paper and allied products industry, by an average of 0.4 percentage point in the furniture and fixture industries, and only marginally in the food and beverage industries.

Prior to 1975, Canadian manufacturing industries exhibited a stronger growth in productivity in all but three cases, that is, in wood and logging, paper and allied products, and machinery, electrical and electronic products industries. Moreover, Canadian industries generally led the U.S. by a wider margin in the 1961-1975 period compared to the full 1961-1988 period.

Text table 1

Average Annual Growth Rate of Multifactor Productivity in Selected Manufacturing Industries: 1961-1988

Industry Name	Canada	United States
Food and beverage industries	0.4	0.5
Plastic, rubber, leather & allied products industries	1.3	1.0
Textile, textile products & clothing industries	1.8	1.6
Wood , logging & forestry industries	2.0	1.8
Furniture & fixture industries	0.2	0.7
Paper & allied products industries	0.2	1.1
Printing, publishing & allied industries	0.7	0.0
Primary metal industries	0.7	-0.2
Machinery, electrical & electronic products industries	1.4	2.5
Transportation equipment industries	1.5	1.1
Non-metallic mineral products	0.9	0.5
Refined petroleum & coal products	0.7	0.2
Chemical & chemical products industries	1.4	1.3
Total manufacturing industries	1.3	1.4

The 1975-1982 period was characterized by a general slowdown in productivity growth in both countries. Despite the U.S. manufacturing group posting a higher average annual growth in productivity than Canada during this period, Canada increased its lead in four out of thirteen industries. However, the slower growth experienced in Canada in recent years seems to be widespread, appearing in all thirteen industries selected in the comparison.

Canada's printing, publishing and allied industries performed better than its U.S. counterpart over long term periods whereas the Canadian paper and allied products industries was behind in most periods. Differences in age and capacity utilization rates of plant and equipment between Canada and the United States are among the factors that could explain this trend. The group encompassing machinery, electrical and electronic products in Canada has also ranked second after the United States in most years. However, as the latter is an aggregate of fairly heterogeneous industries, machinery industries and electrical and electronic products taken individually could have a different ranking. In fact, the electrical and electronic products industry in Canada has been performing very well, ranking among the top contributors to business sector multifactor productivity growth over the last three decades.

iii - Contributions of Industries to Total Manufacturing Productivity Growth

The ranking of the Canadian and U.S. manufacturing industries depends on two things:

1) the relative performance of individual industries, and
2) the composition of the manufacturing group in both countries.

The performance and relative size of manufacturing industries together determine the contribution that each of them will bring to the performance of total manufacturing in any given year. In turn, these contributions allow us to trace the origins of productivity growth in the manufacturing group back to specific industries, thus giving more meaning to the aggregate measure.

Figure 3

Average annual contribution of Canadian industries to total manufacturing multifactor productivity growth, 1961-1988

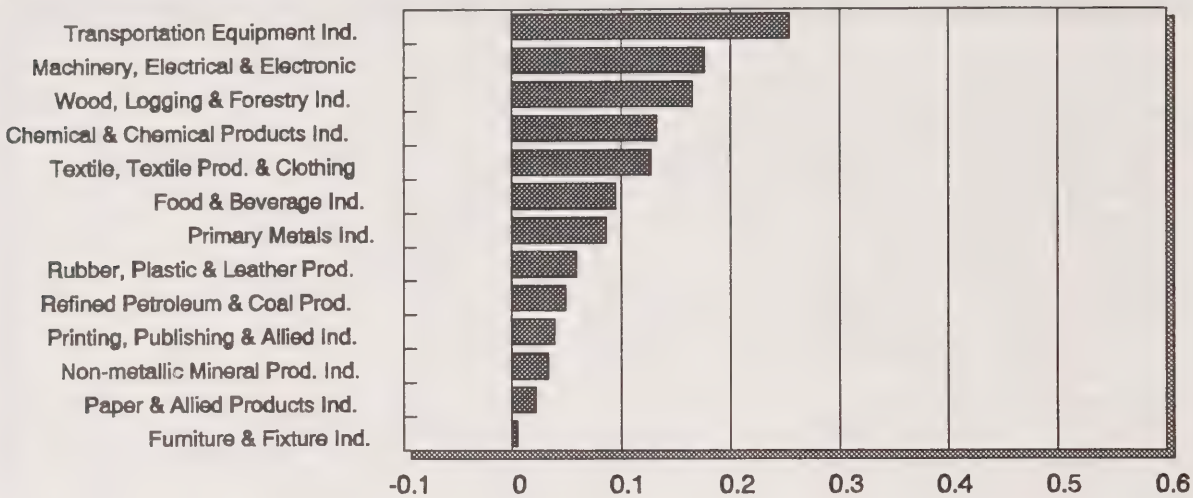
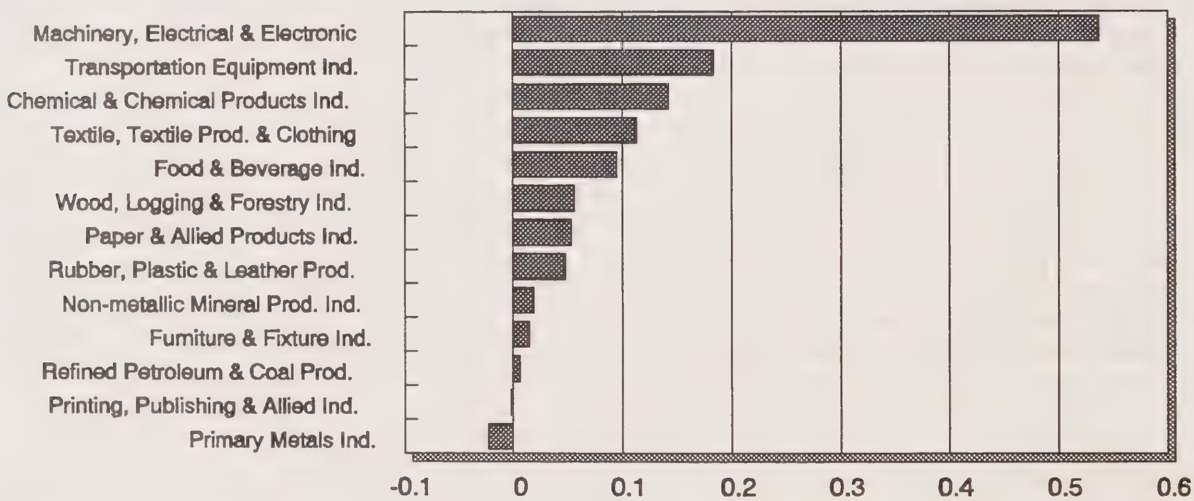


Figure 4

Average annual contribution of U.S. industries to total manufacturing multifactor productivity growth, 1961-1988



Canada

As illustrated in figure 3, the largest contributor to Canadian manufacturing productivity growth over the 1961 to 1988 period was the transportation equipment industry. Machinery, electrical and electronic products industries came in second, followed by wood, logging and forestry industries and by chemical and chemical products industries. The transportation equipment industry was also the largest contributor during the 1961 to 1973 period, but fell to fifth place from 1973 to 1988. The machinery group holds the third and

second rank respectively over those same time spans. The most noteworthy change before and after 1973 took place in the food and beverage industries: this group held the second place from 1961 to 1973 in contrast with an eleventh position from 1973 to 1988, contributing negatively to manufacturing productivity growth in this latter period.

United States

The distribution of contributions to U.S. manufacturing productivity growth over the 1961 to 1988 period as shown in figure 4 is much more dispersed than in Canada. The contribution of the machinery, electrical and electronic products group stands out above all other industries. This group also dominates its Canadian counterpart in terms of productivity growth in all periods considered. The second largest contributor is the transportation equipment industry, followed by chemical and chemical products industries and textile, textile products, and clothing industries. These three U.S. industries came in second after Canada in terms of productivity growth. Although the second, third and fourth largest contributors were weaker than their Canadian counterparts, the growth of productivity in total manufacturing was slightly stronger in the U.S. than in Canada for that period mainly due to the relative size and good performance of the machinery, electrical and electronic products group. The five largest contributors are the same in the pre-1973 period, where the U.S. trails Canada in terms of its manufacturing productivity growth, as in the post-1973 period where the positions are reversed. However, in contrast with the United States, many industries in Canada changed relative positions from one period to the other.

NOTE TO USERS:

*In last year's issue of **Aggregate Productivity Measures**, comparisons with the United States productivity estimates were not made because of upcoming major revisions in the American statistics. Revisions to the estimates for the major sectors of the economy are still in process; therefore, major sector comparisons are still not possible at this time. The overview of the Canada-U.S. comparison presented above is based on the results of a study entitled **Comparability of Multifactor Productivity Estimates in Canada and the United States** which is presented in this publication. The article explains how various methodological and classification problems encountered in making the comparisons were solved and presents the full set of multifactor productivity estimates for total manufacturing and thirteen of its industries for Canada and the United States. As the U.S. estimates for detailed manufacturing industries are not based on the same data sources as the major sector measures, they will not be affected by the revisions mentioned above.*

FEATURE ARTICLE 1

Comparability of Multifactor Productivity Estimates in Canada and the United States

By Marie Allard-Saulnier[3]

Introduction

Canada's competitive position depends on many factors such as a healthy macroeconomic environment, investments in upgrading skills and technology, the size, location and organization of markets, and the trade policy environment in which Canada must do business. However, the key to competitiveness lies in a country's ability to maintain a high level and a stable growth in productivity. International comparability in productivity measures is therefore crucial in the assessment of Canada's competitive position. It is particularly important to have adequate tools to assess Canada's performance relative to its largest trading partner, the United States. In 1991, 76% of Canada's exports were destined to the U.S. market and 69% of the goods and services that were imported into Canada came from the United States. Imports from the U.S. not only compete with Canadian goods and services for Canadians' consumption dollars but also with intermediate inputs going into the production of Canadian commodities. The advent of free trade between Canada and the United States (and possibly Mexico) has raised the stakes of maintaining and improving productivity not only to keep Canada's share of the domestic market but also to respond to the challenge and opportunities arising from the opening of a new and large market south of the border.

Traditionally, international productivity comparisons have been based on labour productivity estimates which are limited in scope. These estimates reflect more than just the increase in the efficiency of the production process; they also include the increase in production due to a more intensive use of other inputs such as capital. In contrast, this article will focus on multifactor (or total factor) productivity measures that evaluate the increase in production not accounted for by the growth of all measured inputs. In addition, productivity comparisons have often limited to the major sectors of the economy. In order to give meaning to these aggregate measures, a look at comparative productivity for more homogeneous groups of industries is in order. In a first attempt to respond to the need for more detailed comparisons, this paper presents comparable multifactor productivity measures for thirteen groups of manufacturing industries in Canada and the United States.

The text will begin with an overview of official multifactor productivity estimates from the U.S. Bureau of Labor Statistics and Statistics Canada. The second section will underscore three issues that must be considered when making international comparisons of productivity: the distinction between comparisons

[3] *I wish to thank all the members of the Productivity Measures Section who have contributed directly or indirectly to this study. In particular, I would like to thank Aldo Diaz and René Durand for their input and feedback. I am also grateful to Sëan Burrows, Ken Young of Industry Division, Daniel April and Jack Bailey of Standards Division, and Nicole Richer for their invaluable assistance.*

of levels and growth rates, methodological issues, and comparability of classifications. All too often, international comparisons are made without regard to these issues, casting doubt on the conclusions derived from such comparisons. The discussion of these issues delineates the terms and conditions of comparability between the official statistics of these two countries to ensure that comparisons are made in a systematic manner. The next section presents estimates of multifactor productivity growth in Canada and the United States. Concluding remarks can be found in the final section, followed by an appendix describing in more detail the methodology for assessing the comparability of classifications.

Official Multifactor Productivity Statistics in Canada and the United States

Statistics Canada's annual estimates of multifactor productivity (MFP) are described at length in the appendices in Part 2 of this publication. Therefore, they will not be discussed in great detail here. In brief, four multifactor productivity measures are available: MFP *industry* measures on value-added, on gross output (also called the neoclassical index), and on gross output net of intra-industry sales, and the *interindustry* MFP index, which measures the productivity of the economy in producing groups of commodities, taking into account the contribution of all industries directly or indirectly involved in producing these commodities.

Statistics Canada's estimates are available at four different levels of aggregation. First, estimates are produced for the total business sector. The next level of detail available (called the "PS" level) comprises twelve non-manufacturing industries along with total manufacturing. At a more detailed level ("PM"), the manufacturing total can be broken down into nineteen industries groups. Finally, the most detailed level ("PL") comprises 110 industries, of which 83 are part of the manufacturing group. The estimates for the four measures at all levels of aggregation are constructed using the Törnqvist index number formula for both outputs and inputs[4].

[4] *The purpose of the index number is to summarize in a single quantitative indicator, several individual measures for which there is no common physical unit of measurement. This is done by choosing a weighting scheme which permits variations in non-additive quantities to be evaluated at a global level. The Törnqvist index is one of many ways to do this. In contrast with the Laspeyres volume index, which is a fixed-weighted arithmetic average of quantity ratios, the Törnqvist volume index is a geometric average of these ratios weighted with average prices of successive years.*

$$\textit{Tömqvist volume index: } Q_1/Q_0=\prod_{l=1}^{n}\left(\frac{Q_{1l}}{Q_{0l}}\right)^{w_l}$$

which can also expressed as:

$$\ln\left(\frac{Q_1}{Q_0}\right)=\sum_{l=1}^{n} w_l * \ln\left(\frac{Q_{1l}}{Q_{0l}}\right)$$

where i = commodities 1 through n

and w_l = average value shares at time 0 and 1

Moreover, indices can differ from one another by the manner in which consecutive changes are combined through time. In the case of the chained Törnqvist, the formula is applied to each consecutive pair of years and the results are chained through multiplication.

Multifactor productivity estimates for the United States are produced by the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor[5]. There are three distinct multifactor productivity programs at the BLS.

Productivity measures for major sectors are produced and published quarterly on the basis of value-added using the *National Income and Product Accounts*[6] as the source for the measure of production. The inputs therefore include only labour (hours worked) and capital services. These measures are available for the following aggregates: total private business sector, manufacturing, farm, and non-farm non-manufacturing. The measures are based on Laspeyres fixed-weighted volume indices for production and inputs.

Annual productivity indices for two-digit manufacturing industries[7] are based on a somewhat different methodology. First, the measure of production used is gross output net of intra-industry sales. Consequently, the combined inputs include capital services, labour inputs, energy, materials and purchased services (hence the name "KLEMS"), which are also net of intra-industry transactions. In general, inputs and outputs are measured with chained Törnqvist indices.

The MFP measures on the basis of gross output net of intra-industry sales are also available for detailed industries. The calculations are also done using the Törnqvist index number formula for inputs and outputs. They are published for six industries at the three- and four-digit levels of the 1987 U.S. Standard Industrial Classification. The industries are: blast furnace and basic steel products (SIC 331); motor vehicles and equipment (SIC 371); footwear, except rubber (314); tires and inner tubes (3011); farm and garden machinery (352); and railroads, line-haul operating (4011).

Productivity comparisons for the major sectors of the economy can only be made with caution as the index number formula used to calculate the volume of outputs and inputs differ between the two countries. As stated above, the Törnqvist index formula is used in the Canadian estimates whereas the BLS uses Laspeyres fixed-weighted volume indices in the case of the major sector measures. Differences in the index number formula create artificial differences in the growth of the series being compared.

Comparisons will therefore be based on U.S. multifactor productivity measures for two-digit manufacturing industries and the Canadian estimates of multifactor productivity on gross output net of intra-industry sales at the "PM" level. The choice of measures used in the comparison was based on several considerations. First, for practical reasons, this study was limited to comparisons with existing U.S. estimates. Second, the two sets of estimates are the most comparable in methodology as will be described in more detail below. Finally, this choice made it possible to make comparisons that covered the manufacturing group (which is particularly exposed to international competition) while still maintaining some detail by industry.

What are Meaningful Comparisons?

This section describes the various issues that should be kept in mind while constructing comparable productivity estimates and while interpreting the results of the comparisons. Although these issues are important, they are often overlooked. It is necessary to answer the following questions in order to put in context the results of the comparisons which are presented in a subsequent section. Are the estimates

[5] *We would like to express our gratitude to William Gullickson of the Bureau of Labor Statistics for providing the necessary data.*

[6] *The National Income and Product Accounts are produced by the Bureau of Economic Analysis of the U.S. Department of Commerce.*

[7] *From the 1972 U.S. Standard Industrial Classification.*

comparable in level or in terms of growth? Are the estimates constructed using a similar methodology? Do the industries represent similar production activities or similar commodity outputs?

i - Growth Rate Versus Level Comparisons

There are two different ways to compare productivity measures: in terms of growth or levels. When using the first approach, it is important to understand that comparing the *change* in productivity for two countries does not give any information on which of the two countries is more productive, but only which of the two has increased its productive efficiency more between two given points in time. This approach is more easily implemented as it requires less information. When comparing productivity gains for two countries, inputs and outputs are evaluated at prices of the same year but using the price structure of each country, in their respective currency. In other words, the value of inputs and outputs are deflated in such a way as to make their volumes comparable from year to year within each country but not comparable between countries.

In contrast, bilateral *level* comparisons require that inputs and outputs of both countries be expressed in the same price structure in order to ensure that the volume of these inputs and outputs are comparable for the two countries. This is done separately for each component with special conversion factors called purchasing power parities (PPP's).[8] Purchasing power parities take into account differences in relative prices of commodities across countries and are defined in such a way as to convert values expressed in one country's currency and price structure into the other country's currency and price structure, thus making it possible to isolate differences in the volume of commodities produced or purchased in both countries.

Constructing PPP's for purposes of productivity comparisons with the United States would involve the collection of prices in Canada and the U.S. for very specific commodity outputs and inputs with equivalent characteristics in order to isolate the "pure" volume difference. The calculation of purchasing power parities on final demand components for several countries has already been undertaken by the Organization for Economic Cooperation and Development (OECD). However, the availability of specific input prices is particularly problematic as this may pose confidentiality problems. Level comparisons for multifactor productivity would require a great deal of cooperation between participating countries to make the data available, to agree on standard definitions and methodology and to deal with the complexities of collecting and processing the data. Comparisons based on official statistics are therefore limited to productivity gains for the time being[9].

ii - Methodology

Since the Bureau of Labor Statistics has three different multifactor productivity programs as described above, methodological differences with Statistics Canada's estimates depend on which U.S. estimates are considered. In the case of the two-digit KLEMS index which is the focus of this paper, methodological differences with Statistics Canada's productivity estimates on gross output net of intra-industry sales are minor.

First, Statistics Canada's hours worked at the level of 19 manufacturing industry groups are weighted averages of hours worked at the most detailed level where MFP estimates are calculated (i.e. 83

[8] *For more information on the use of purchasing power parities in making international comparisons, see Schultz (1992).*

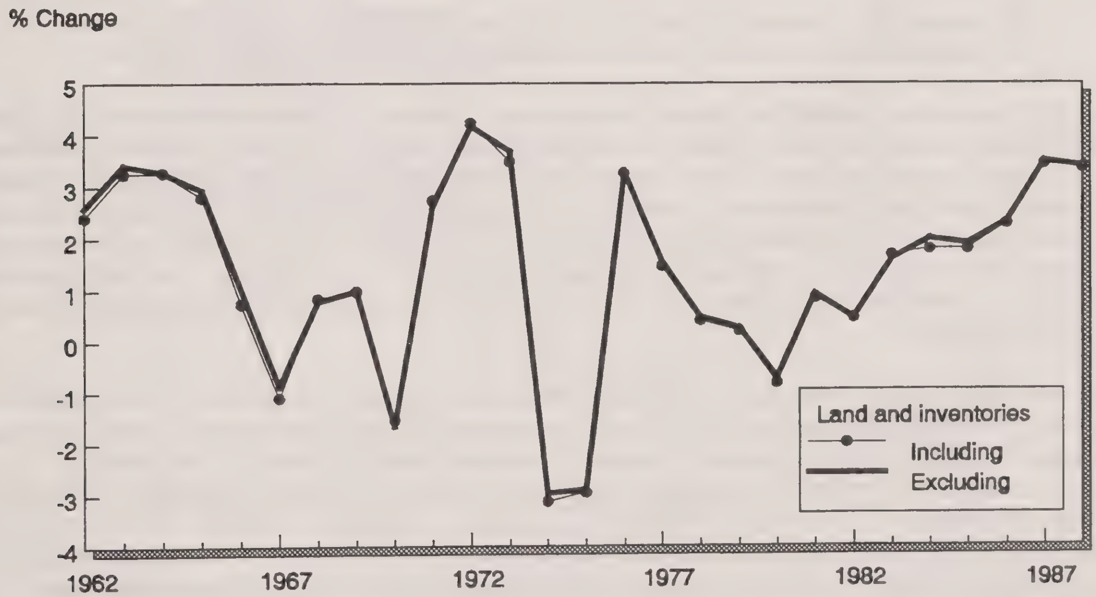
[9] *Productivity level comparisons for manufacturing industries in Canada, Japan and the United States can be found in Denny et al (1992). However, the comparisons were based on the authors' own estimates of purchasing power parities for the United States - Canada comparison.*

manufacturing industries) with hourly wages used as weights. In contrast, the BLS uses the sum of hours worked for two-digit industries as the measure of labour input. In other words, the BLS considers hours worked to be homogeneous within each two-digit industry group whereas Statistics Canada takes into account differences in returns to labour between the industries included in each of the 19 groups. A further difference is found in the calculation of capital inputs. In both countries, the cost of capital services is calculated residually for each industry as the difference between the value of gross output net of intra-industry sales and the cost of inputs other than capital, that is, labour costs and the cost of intermediate inputs. However, the BLS distributes this residual capital cost by type of asset and industry according to an estimated rental cost, whereas no distinction is presently made between asset types in Canada.

Second, capital services are estimated from a net capital stock based on delayed depreciation in the U.S. estimates as opposed to geometric depreciation in the Canadian estimates. The BLS tested the sensitivity of multifactor productivity and capital input measures to the assumption about the form of the efficiency function. Their conclusion was that "it is evident that the method selected has little effect on the final measure of multifactor productivity, for year-to-year changes or over a long time period."[10] In fact, for the private business sector, the difference between MFP estimates derived from the two types of depreciation never exceeds two tenths of a percentage point in any given year between 1949 and 1981 and is never more than one tenth of a percentage point over longer periods. From a practical point of view, differences in the choice of efficiency functions are not sufficiently important to justify the recalculation of either country's productivity estimates to conform with the other's.

Figure 1

Comparative Measures of Multifactor Productivity Growth for U.S. Manufacturing Industries



[10] *From Trends in Multifactor Productivity 1948-1981, U.S. Department of Labor, Bureau of Labor Statistics, Bulletin 2178, September 1983, p. 57.*

A further difference in the measure of capital inputs is the inclusion of land and inventories by the BLS in addition to fixed capital whereas Statistics Canada presently includes only the latter in its measure. The BLS estimates used in this study have been recalculated without land and inventories in the measure of capital inputs to eliminate this methodological difference.

In removing land and inventories from the U.S. estimates to make the measures more comparable to ours, it was possible to test the sensitivity of the productivity estimates to the inclusion of these two assets in the measure of capital services. As can be seen in figure 1, this methodological difference has no significant impact on the multifactor productivity measure for total manufacturing. Looking at more detailed estimates, the impact is also practically imperceptible, leaving the Canada-U.S. ranking unchanged in any of the periods considered.

In future comparisons, the KLEMS indices from the Bureau of Labor Statistics can therefore be used "as is", that is without excluding land and inventories from capital inputs, in making comparisons with the relevant Canadian industry groups. This will significantly cut down on the preparatory work needed to make the estimates comparable.

iii - Comparability of Industrial Classifications

The concordance between industrial classifications is important to keep in mind in the context of international productivity comparisons. It may be tempting to dismiss this problem as being empirically insignificant but comparisons may have little meaning when they do not pertain to similar activities.

The definition of Canadian and U.S. industries in their respective industrial classifications differ for two basic reasons:

a- because of differences in the size and structure of the two economies
b- because of differences in the criteria used in developing the classifications

In order to compare any industrial statistics for the two countries, it is therefore necessary to establish a correspondence, where possible, between the two classifications. A conceptual concordance between the 1980 Canadian Standard Industrial Classification (SIC) and its 1987 U.S. counterpart was developed jointly by Statistics Canada and officials from various agencies of the U.S. government[11]. This concordance does not offer a quantitative measure of the comparability of industry groups. Rather, it provides a list of comparable industry groups on the basis of the commodities that they produce or the activities in which they engage, as well as a list of descriptions of the goods and services (or activities) not common to the two groups in question.

Drawing from the results of work in progress in other areas of Statistics Canada, it was possible to go beyond the conceptual concordance and to assign a measure of the degree to which industry groups are comparable. By assigning U.S. industry codes to Canadian establishments, it was possible to express Canadian establishment data (in this case, shipments) in both classification structures, that is, in the Canadian SIC and the U.S. SIC. In brief, comparable industries or groups of industries in both classifications were selected in a manner such that the two industry definitions overlap by at least 90% in terms of the 1988 value of Canadian shipments. The comparability measures are described in further detail in the appendix.

[11] *U.S. Bureau of the Census and Statistics Canada, Concordance between the Standard Industrial Classifications of Canada and the United States: 1980 Canadian SIC - 1987 United States SIC, Statistics Canada catalogue no. 12-574E, February 1991.*

Comparability measures can be used to evaluate the concordance at various levels of aggregation. On the basis of these measures, in the case of the twenty U.S. manufacturing industries for which the KLEMS index is available, nine industries were found to have a directly comparable Canadian industry at the "PM" level, (i.e. a one-to-one equivalence), as can be seen in text table 1 below. It was necessary to aggregate the Canadian logging and forestry industry ("PL3") which is outside of Canadian manufacturing to the Canadian wood industry to conform with the definition of the lumber and wood products industry of the U.S. manufacturing group. At the same time, this bridges the gap between the Canadian and the American manufacturing group definitions. After other aggregations, comparisons could be established for fourteen groups of industries. The remaining industries are not reasonably comparable as the U.S. definitions differ from ours to the point where only a full aggregation would allow meaningful comparisons to be made.

Text table 1

Concordance between Canadian industries at the PM level and 2-digit U.S. industries

Canadian Industries at the PM Level		
Codes		
PM	Industry Name	U.S. 2-digit industries
5+6	Food and beverage industries	20
7	Tobacco products industries	21
8+9	Plastic, rubber, leather & allied products industries	30+31
10	Textile, textile products & clothing industries	22+23
11+PL3	Wood , logging & forestry industries	24
12	Furniture and fixture industries	25
13	Paper & allied products industries	26
14	Printing, publishing & allied industries	27
15	Primary metal industries	33
17+19	Machinery, electrical & electronic products industries	35+36
18	Transportation equipment industries	37
20	Non-metallic mineral products industries	32
21	Refined petroleum & coal products	29
22	Chemical & chemical products industries	28
PM 5 to 23 + PL 3	Total manufacturing	20 to 39

Productivity Growth in Canada and the United States

Comparisons of productivity growth for a given year are not particularly meaningful as establishments in the two countries may be operating at different levels of capacity utilization for various reasons. One of these reasons may be the timing and amplitude of the business cycles. For this reason, comparisons are usually done on the average annual growth over a full business cycle or over long time spans. These long-term comparisons are more meaningful in that they are less sensitive to temporary fluctuations in productivity due to adjustments to changes in the economic environment.

When comparing productivity growth over business cycles, we must bear in mind that although the timing of business cycles is very similar in Canada and the United States, the amplitude and the breadth of contractions and expansions in economic activity may be very different in the two countries. Over the period covered by this study, Canada experienced recessions in 1970, in 1975, in 1980 (only a minor slowdown), and in 1982. In the United States, the troughs in the business cycles were in 1970, in 1974-75, in 1980, and in 1982. In addition to these "official" recessions, there were other minor slowdowns in economic activity in both countries such as the one in 1967. The two economies also experienced slower growth in the mid-80s.

During a recession, not all industries suffer from the slowdown to the same extent and at the same time. Estimates of the growth of real output net of intra-industry sales by industry since 1961 (not shown here) indicate that, in fact, most peaks and troughs in activity have been concurrent for corresponding industries in both countries. Moreover, the output cycles in most industries followed those in the general economic activity. However, there are differences in the amplitude of production cycles that may explain differences in productivity growth rates over the periods we have chosen to present.

Table 1 below presents the multifactor productivity indices based on gross output net of intra-industry sales for thirteen manufacturing industries and total manufacturing in Canada and the United States. Although comparisons could be done for fourteen industries or groups of industries, only thirteen are presented and analyzed in this paper. Estimates for the U.S. tobacco products industry are not shown because input shares used in the calculation of the estimates have exhibited unexplained variations over the 1961-1988 period. The base year was set to 1961 to facilitate growth comparisons between the two sets of estimates. The bar chart shown below table 1 depicts the average annual growth rate in productivity by country from 1961 to 1988 for each of the industries in the table.

i - Aggregate Trends

Over the 1961 to 1988 period, estimates of productivity growth in Canadian and American manufacturing exhibited very similar trends. The United States' manufacturing industries posted a marginally higher average annual growth rate over the twenty seven year period at 1.4%, compared with Canadian manufacturing at 1.3%. The difference, however, may not be significant given the normal range of uncertainty surrounding any estimate. Behind this seemingly comparable long term performance of the manufacturing group in Canada and the U.S. lie many differences across industries and through time that must be examined in order to gain a better understanding of the situation.

On average from 1961 to 1975, productivity in Canadian manufacturing fared better than its long term average, growing by 1.6% annually. The 1975 to 1982 cycle was characterized by poor productivity growth in these industries. After 1982, productivity growth rebounded to an average annual growth of 1.6% which was slightly higher than the 1961-1988 average. This recovery was characterized by strong growth in 1983 and 1984 followed by a modest growth in the following years.

Manufacturing industries in the United States had a comparatively poorer performance than in Canada in the pre-1975 period, exhibiting a weaker growth than their long-term average. Although the recession of the mid-70s appears to have inflicted a more severe blow to manufacturing productivity in the United States compared to Canada, productivity growth reached the same peak in both countries during the subsequent recovery. In contrast, multifactor productivity declined much more in Canada than in the United States during the 1982 recession, resulting in a stronger 1975-1982 average annual growth of 0.9% in the United States compared with a 0.5% average growth in Canada. Although the initial recovery was more vigorous in Canada, the United States' average annual productivity performance in the 1980s exceeded that of Canada by almost a full percentage point.

These findings are consistent with the history of business cycles in the two countries as the United States experienced a more severe and prolonged recession in the mid-70s compared to Canada whereas Canada's economy took a much more severe blow in 1982 compared to the United States.

In brief, if we consider the 1961-1988 annual average growth as the norm, Canada's manufacturing productivity did return to "normal" rates of growth after the 1982 recession but comparatively, the United States has experienced greater than "normal" productivity gains over the same period.

ii - Comparative Performance of Individual Industries

Canada's multifactor productivity grew at a relatively faster pace than that of the United States in nine of the thirteen industries over the 1961-1988 period as shown in table 1. In most cases however, the difference in growth rates is marginal. The two largest average growth differentials in favour of Canada were found in the following industries:

- primary metal industries (0.8 percentage point gap)
- printing, publishing & allied industries (0.7 percentage point gap)

During this period, Canada lagged behind in four industries: by an average of 1.2 percentage points in the machinery, electrical and electronic group, by an average of 0.9 points in the paper and allied products industry, by an average of 0.4 percentage point in the furniture and fixture industries, and only marginally in the food and beverage industries.

Prior to 1975, Canadian manufacturing industries exhibited a stronger growth in productivity in all but three cases, that is, in wood and logging, in paper & allied products, and in machinery, electrical and electronic products industries. Moreover, Canadian industries generally led the U.S. by a wider margin in the 1961-1975 period compared to the full 1961-1988 period.

As indicated above, the 1975-1982 period was characterized by a general slowdown in productivity growth in both countries. Despite the U.S. manufacturing group posting a higher average annual growth in productivity than Canada between 1975 and 1982, Canada increased its lead in four out of thirteen industries.

During the recovery of the 1980s, the gap widened in favour of the United States at the total manufacturing level. However, at the detailed level, in eleven out of thirteen industries, either the gap between the two countries' growth rate narrowed in comparison with the 1975-1982 period (in four cases) or the comparative ranking was reversed (in seven cases), indicating that the relative positions of industries tend to change through time.

Since 1985, Canada's manufacturing multifactor productivity has exhibited slower growth in comparison to its southern neighbour. The slower growth experienced in Canada in recent years seems to be widespread, appearing in all thirteen industries selected in the comparison.

Text table 2 highlights some features that are consistent throughout the period. Canada's printing, publishing and allied industries come in first in all periods considered. The Canadian paper and allied products industries is behind in all five periods. Differences in age and capacity utilization rates of plant and equipment between Canada and the United States are among the factors that could explain this trend. The group encompassing machinery, electrical and electronic products in Canada has also come in second after the United States in all periods considered. However, as the latter is an aggregate of fairly heterogeneous industries, machinery industries and electrical and electronic products taken individually could have a different ranking. In fact, the electrical and electronic products industry in Canada has been

performing very well, posting the second highest average annual contribution to multifactor productivity growth in the Canadian business sector from 1961 to 1988. These two groups cannot be examined separately since their definitions in the Canadian and the U.S. industrial classifications overlap one another considerably.

Text table 2

Comparative Rankings of Productivity Growth in Manufacturing Industries: Canada (C) and United States (US)*

Industry name	1961-88		1961-75		1975-82		1982-88		1961-73		1973-88	
	C	US	C	US	C	US	C	US	C	US	C	US
Total manufacturing	2	1	1	2	2	1	2	1	1	2	2	1
Food and beverage industries	2	1	1	2	2	1	2	1	1	2	2	1
Plastic, rubber, leather & allied prod. ind.	1	2	1	2	1	2	2	1	1	2	2	1
Textile, textile products & clothing ind.	1	2	1	2	2	1	1	2	1	2	1	2
Wood, logging & forestry industries	1	2	2	1	1	2	1	2	2	1	1	2
Furniture and fixture industries	2	1	1	2	2	1	2	1	1	2	2	1
Paper & allied products industries	2	1	2	1	2	1	2	1	2	1	2	1
Printing, publishing & allied industries	1	2	1	2	1	2	1	2	1	2	1	2
Primary metal industries	1	2	1	2	2	1	1	2	1	2	1	2
Machinery, electrical & electronic products ind.	2	1	2	1	2	1	2	1	2	1	2	1
Transportation equipment industries	1	2	1	2	1	2	2	1	1	2	2	1
Non-metallic mineral products industries	1	2	1	2	2	1	1	2	1	2	2	1
Refined petroleum & coal products	1	2	1	2	1	2	2	1	1	2	1	2
Chemical & chemical products industries	1	2	1	2	2	1	1	2	2	1	1	2

* A value of 1 (or 2) indicates the country in which the industry exhibited the higher (or lower) productivity growth.

iii - Correlation of the Estimates

Over the 1961 to 1988 period, in six out of thirteen industries, Canada's productivity growth estimates are correlated with their U.S. counterpart[12]. Productivity growth estimates for total manufacturing in both countries naturally show a stronger correlation than most component industry considered individually as conflicting movements in the individual industries' productivity growth estimates tend to cancel out as they are aggregated together. The refined petroleum and coal products industry is displaying the weakest correlation with its U.S. counterpart whereas chemical & chemical products industries show the strongest correlation. If we compare the 1961-1973 period to the 1974-1988 period, a structural change seems to have taken place. In the first period, the Canadian and U.S. estimates for total manufacturing are strongly correlated, whereas after 1973, the correlation falls slightly below 0.5. In the 1961-1973 period, seven Canadian industries are correlated with their U.S. counterparts. In contrast, only three industries are correlated when considering the 1974-1988 period.

[12] *For purposes of this analysis, estimates are considered to be correlated if the correlation coefficient exceeds 0.5.*

Table 1 - Multifactor Productivity Indices for Selected Manufacturing Industries in Canada and the United States, (1986=100), continued...

	Total manufacturing industries		Food and beverage industries		Plastic, rubber leather & allied products		Textile, textile products & clothing	
Year	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	104.6	102.6	101.6	101.0	105.7	102.6	105.6	102.6
1963	107.3	106.1	102.2	102.1	107.6	103.9	109.0	104.5
1964	110.3	109.6	103.2	102.3	110.6	105.9	109.7	106.3
1965	112.4	112.8	104.5	104.8	111.4	107.0	109.1	107.9
1966	112.7	113.9	105.0	105.9	113.3	106.6	109.0	109.9
1967	111.2	112.9	106.2	105.1	112.5	106.7	107.7	112.0
1968	114.6	113.8	105.8	104.5	117.2	107.5	113.3	111.0
1969	118.0	114.9	106.5	105.1	119.7	109.1	115.8	112.5
1970	116.5	113.0	107.1	105.7	117.7	105.9	114.9	115.2
1971	120.0	116.0	109.9	107.3	119.9	109.6	120.0	118.1
1972	124.1	120.8	110.4	108.7	121.6	111.5	125.4	124.2
1973	128.7	125.3	112.4	109.4	125.2	114.2	128.3	125.0
1974	128.8	121.5	111.9	105.3	120.8	110.8	128.4	122.4
1975	124.6	118.0	109.5	106.2	117.2	109.7	130.5	123.1
1976	129.2	121.9	112.7	107.5	122.8	110.1	135.1	128.0
1977	132.7	123.8	114.4	105.3	128.2	110.7	140.0	135.5
1978	134.1	124.4	114.3	106.3	133.0	110.4	147.3	134.2
1979	134.5	124.7	114.5	107.2	136.4	109.1	151.9	136.8
1980	132.2	123.8	113.2	108.2	133.5	110.3	152.2	140.2
1981	134.8	124.9	112.9	109.6	135.4	117.3	155.2	140.0
1982	129.4	125.5	112.9	112.0	132.6	118.1	147.5	142.6
1983	135.1	127.5	112.0	112.8	138.8	120.0	154.0	145.7
1984	141.5	130.0	113.1	112.8	146.1	121.8	157.2	145.3
1985	143.7	132.5	114.3	114.2	147.0	125.2	159.9	146.6
1986	142.5	135.5	113.5	114.4	141.7	124.9	164.4	150.9
1987	142.6	140.3	113.3	113.9	142.9	129.3	164.7	154.0
1988	142.3	145.0	111.3	114.3	140.7	129.3	161.0	154.5

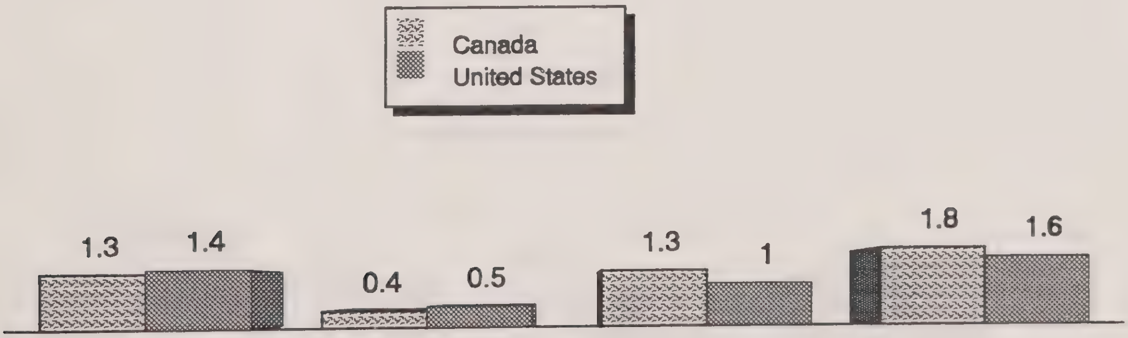


Table 1 - Multifactor Productivity Indices for Selected Manufacturing Industries in Canada and the United States, (1986=100), continued...

Year	Wood, logging & forestry industries		Furniture & fixture industries		Paper & allied prod. industries		Printing, publishing & allied industries		Primary metal industries	
	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	103.0	101.5	102.0	98.9	100.2	100.5	101.7	96.3	102.4	100.2
1963	108.3	109.6	104.8	102.0	101.7	101.7	102.0	99.0	103.3	102.8
1964	109.7	121.2	104.5	103.4	104.1	104.2	101.5	102.4	105.5	105.7
1965	109.1	124.7	107.7	105.8	102.6	104.7	101.0	102.5	107.8	106.2
1966	110.1	124.3	109.1	105.8	101.8	104.4	102.0	103.5	107.3	107.7
1967	110.3	130.0	108.9	105.2	97.4	102.2	102.1	103.1	104.4	104.6
1968	116.2	133.5	110.6	105.4	98.2	105.5	102.8	102.1	108.3	102.0
1969	118.9	128.9	113.7	107.5	101.1	108.3	103.5	103.1	109.3	100.8
1970	120.5	134.3	110.5	104.3	101.0	105.9	102.2	98.9	108.5	98.3
1971	121.2	134.6	112.1	105.4	100.8	108.8	103.2	99.5	108.0	99.3
1972	122.4	141.1	119.7	111.4	104.1	113.8	106.6	101.6	109.9	101.6
1973	123.1	140.6	123.6	112.6	107.6	120.6	110.8	103.5	112.4	106.1
1974	122.1	142.0	112.7	111.0	110.0	118.0	110.5	102.4	113.4	104.0
1975	117.5	143.2	111.1	109.8	97.1	109.9	111.8	101.0	110.4	92.9
1976	124.4	142.7	117.1	113.5	104.1	114.2	118.3	102.0	107.1	93.3
1977	129.7	139.9	118.1	115.2	103.8	116.1	122.6	102.5	111.3	90.6
1978	129.6	136.5	123.1	117.6	106.0	117.8	125.2	101.9	112.9	92.1
1979	129.5	140.6	120.1	117.0	107.3	116.7	124.6	101.2	107.9	90.9
1980	135.1	146.1	118.4	117.9	105.8	113.7	124.5	99.4	105.4	91.3
1981	137.9	140.7	119.7	117.1	105.5	116.0	125.5	101.5	109.3	92.5
1982	136.0	133.8	107.5	118.0	98.5	120.7	119.3	100.5	102.6	88.0
1983	146.8	138.9	114.5	117.9	103.5	125.8	122.9	100.2	109.0	84.6
1984	158.0	144.1	117.0	119.1	105.0	123.9	126.4	99.4	113.7	87.7
1985	163.8	142.4	118.1	119.5	105.2	124.3	126.4	99.2	117.9	88.8
1986	167.4	147.1	115.7	118.9	105.5	128.6	125.0	98.6	116.8	89.5
1987	172.4	159.2	110.0	121.6	107.2	130.0	121.7	100.2	119.9	90.7
1988	170.8	163.3	106.8	119.6	105.0	133.0	120.8	98.9	119.9	95.4

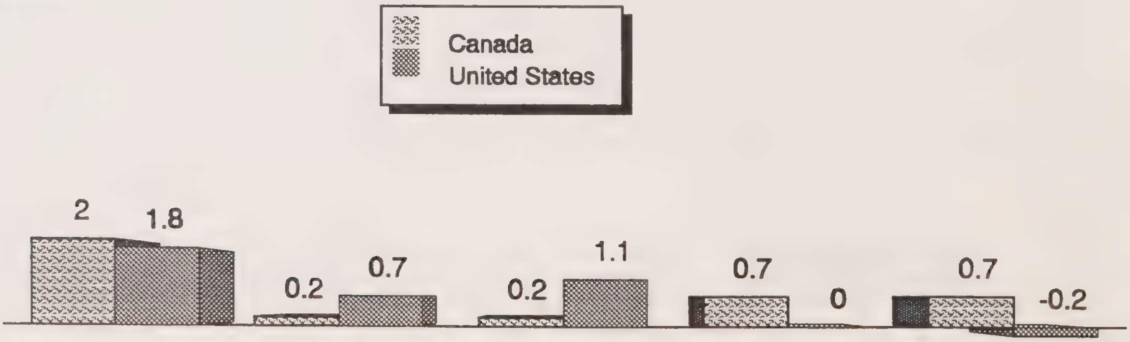
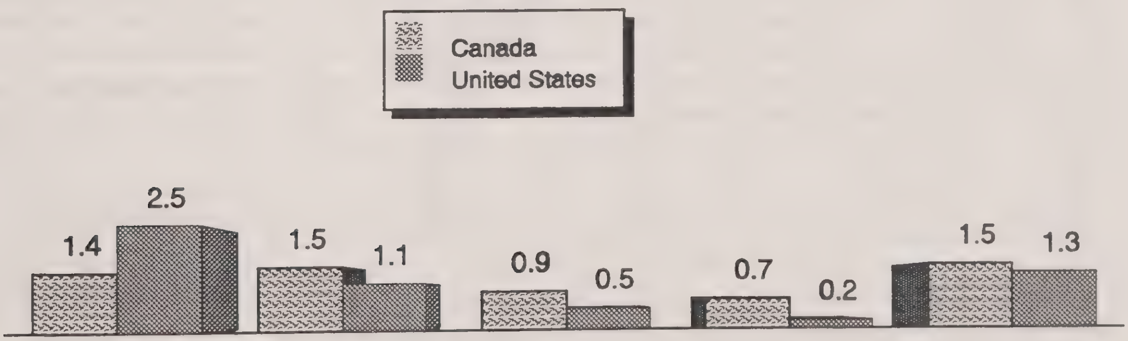


Table 1 - Multifactor Productivity Indices for Selected Manufacturing Industries in Canada and the United States, (1986=100), concluded.

Year	Machinery, electrical & electronic products industries		Transportation equipment industries		Non-metallic mineral products industries		Refined petroleum & coal products		Chemical & chemical products industries	
	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	107.2	104.6	104.6	102.9	107.2	100.6	105.4	100.9	103.4	103.0
1963	108.9	107.3	109.2	108.2	108.5	104.3	106.4	102.0	106.6	106.2
1964	113.5	112.0	110.4	111.2	112.5	105.9	108.8	103.2	111.1	110.5
1965	115.8	115.6	115.2	116.0	114.4	106.3	111.2	102.9	113.3	112.8
1966	117.0	116.9	113.1	114.8	115.2	104.9	113.1	103.0	114.2	112.5
1967	112.9	116.5	118.2	113.2	108.2	103.4	108.4	103.5	112.0	108.7
1968	114.9	116.7	120.9	115.3	113.0	104.4	110.6	105.2	112.8	111.7
1969	118.5	118.9	127.5	114.5	115.1	104.9	109.0	105.7	114.8	112.9
1970	116.6	118.5	122.7	109.2	113.4	102.4	109.3	107.4	114.2	113.4
1971	113.6	119.3	129.6	116.5	121.8	103.3	109.8	108.3	118.7	117.0
1972	118.2	125.8	134.0	117.3	131.2	107.2	109.6	109.1	121.8	123.0
1973	122.8	130.8	139.6	121.4	124.0	109.0	113.9	110.4	127.9	128.4
1974	123.3	128.7	140.9	120.1	118.8	105.7	113.3	109.9	127.9	122.3
1975	120.1	125.1	144.0	120.4	115.0	104.3	114.1	108.1	119.8	115.1
1976	123.6	130.6	145.8	125.3	116.3	107.0	113.4	108.3	125.5	119.6
1977	127.7	137.8	146.8	126.3	115.0	106.2	117.0	108.7	124.8	122.5
1978	127.7	140.6	147.1	125.2	117.0	106.3	114.4	108.5	128.9	122.7
1979	135.5	143.9	146.9	122.6	117.6	105.2	112.8	107.3	132.5	123.7
1980	137.7	147.5	138.2	117.6	110.5	103.4	113.3	107.6	128.2	117.4
1981	137.3	151.3	140.2	112.7	109.9	102.5	115.9	105.8	133.1	121.9
1982	129.4	153.1	138.9	114.5	102.5	102.5	118.6	104.5	124.3	123.3
1983	128.7	155.8	143.2	119.4	109.7	104.7	120.4	103.6	135.3	128.3
1984	138.6	159.2	148.8	122.5	115.5	106.5	121.1	104.9	140.7	127.9
1985	140.6	166.7	150.4	123.9	120.8	108.5	119.7	105.1	142.2	127.5
1986	142.0	172.5	148.4	125.7	123.2	110.8	118.4	105.7	142.8	134.4
1987	141.6	184.0	145.7	130.1	125.9	111.2	119.3	105.7	145.6	137.8
1988	144.6	196.2	148.2	133.0	125.9	113.7	119.7	106.3	148.3	143.4



iv - Contributions of Industries to Total Manufacturing Productivity Growth

The ranking of the Canadian and U.S. manufacturing aggregates depends on two things:

1) the relative performance of individual industries as was presented in the section above, and
2) the composition of total manufacturing in both countries.

The performance and relative size of manufacturing industries together determine the contribution that each of them will bring to the overall performance of the group in any given year. In turn, these contributions allow us to trace the origins of productivity growth in total manufacturing back to specific industries, thus giving more meaning to the aggregate measure.

Canada

As illustrated in figure 2, the largest contributor to Canadian manufacturing productivity growth over the 1961 to 1988 period was the transportation equipment industry. Machinery, electrical and electronic products industries came in second, followed by wood, logging and forestry industries and by chemical and chemical products industries. The distribution of contributions is less dispersed for Canada than for the United States, ranging from 0.25 percentage point for transportation equipment to almost zero for the furniture and fixture industries. The transportation equipment industry was also the largest contributor during the 1961 to 1973 period, but fell to fifth place from 1973 to 1988. The machinery group holds the third and second rank respectively over those same time spans. The most dramatic change before and after 1973 takes place in the food and beverage industries: this group holds the second place from 1961 to 1973 in contrast with an eleventh position from 1973 to 1988, contributing negatively to manufacturing productivity growth in this latter period.

United States

The distribution of contributions to U.S. manufacturing productivity growth over the 1961 to 1988 period as shown in figure 3 is much more dispersed than in Canada. The contribution of the machinery, electrical and electronic products group stands out above all other industries. This group also dominates its Canadian counterpart in terms of productivity growth in all periods considered. The second largest contributor is the transportation equipment industry, followed by chemical and chemical products industries and textile, textile products and clothing industries. These three U.S. industries came in second after Canada in terms of productivity growth. Although the second, third and fourth largest contributors were weaker than their Canadian counterparts, the growth of productivity in total manufacturing was slightly stronger in the U.S. than in Canada for that period mainly due to the relative size and good performance of the machinery, electrical and electronic products group. The five largest contributors are the same in the pre-1973 period, where the U.S. trails Canada in terms of its manufacturing productivity growth, as in the post-1973 period where the positions are reversed. However, in contrast with the United States, many industries in Canada changed relative positions from one period to the other.

The average annual contributions of the thirteen component industries cannot fully explain changes in total manufacturing productivity as they do not represent a full coverage of the manufacturing group. As can be inferred from text table 1, there are three U.S. industries which are not covered by this study because of inadequate comparability. They are: fabricated metal products industries (SIC 34), instruments and related products (SIC 38), and miscellaneous manufacturing (SIC 39). The Canadian manufacturing industries for which this study presents no comparable estimates are fabricated metal products (PM 16) and other manufacturing industries (PM 23). In addition, as stated above, no comparison is made for the tobacco products industry due to unexplained trends in the U.S. estimates. Productivity growth in these

industries is nevertheless implicitly included in the estimates for total manufacturing. We must bear this in mind when using a contribution analysis to explain total manufacturing productivity growth.

Figure 2

Average annual contribution of Canadian industries to total manufacturing multifactor productivity growth, 1961-1988

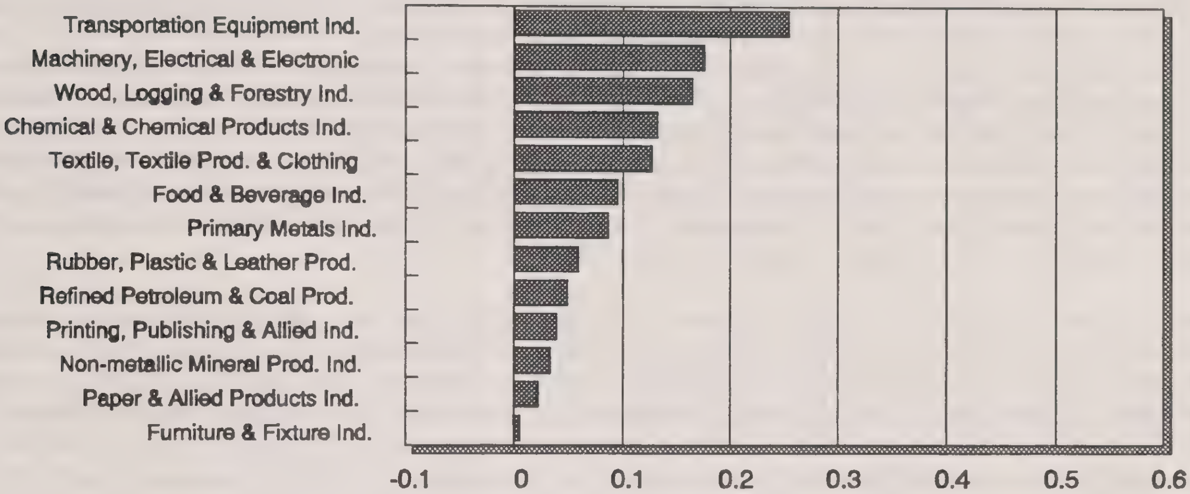
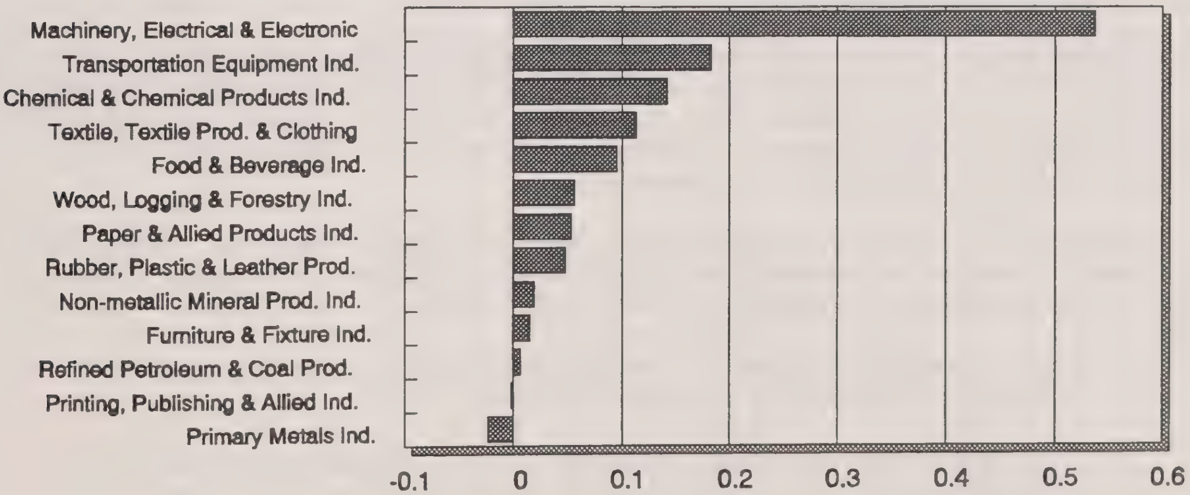


Figure 3

Average annual contribution of U.S. industries to total manufacturing multifactor productivity growth, 1961-1988



Conclusion

International productivity comparisons are an important element in assessing Canada's competitiveness at home and abroad. Making these comparisons is not always straightforward as many factors must be taken into account. Differences in methodologies and classifications must be identified and if possible, eliminated, in order to make meaningful comparisons. Aside from informing the readers of the many issues to consider in making productivity comparisons, the main contribution of this study was to present estimates of multifactor productivity *for comparable sets of production activities* in both countries based on the quantitative measures of comparability of industrial classifications presented in the appendix below.

The comparisons described in the paper were restricted to the industries for which U.S. multifactor productivity indices were already available. The methodology described in the appendix could be used to find comparable Canadian and U.S. industry groups at various levels of aggregation. In fact, comparability measures have been calculated for the most detailed level at which Statistics Canada produces multifactor productivity estimates for manufacturing, that is, for 83 industries. Fifty-three of these industries have comparable groups of four-digit U.S. industries. The industries for which there is no correspondence will be the subject of further research in the near future.

Unfortunately, multifactor productivity estimates for the United States are not readily available for the combinations of U.S. four-digit industries that were found to be comparable to 53 Canadian manufacturing industries. The collection of the appropriate U.S. statistics needed to construct these estimates, an exercise of sizeable proportions, could be undertaken if there was sufficient interest in these estimates.

The overall conclusion stemming from the results of the comparisons is that manufacturing productivity growth in Canada and the United States has evolved in a very similar way over the last three decades. In the last few years of the comparison, the situation in Canada seems to have deteriorated, and this, in most industries covered by the study. Perhaps, this is a temporary phenomenon but nevertheless, it has raised some concerns in many circles. As the data becomes available, it will be interesting to see if this trend persists over the current years.

Appendix

As explained above, differences in industrial classifications must be resolved in order to be able to make meaningful comparisons of productivity on an international level. In fact, this is the case with international comparisons of any industrial statistics. The purpose of this appendix is to describe in greater detail the approach taken to measure the degree of comparability of industrial classifications and on this basis, how the best match of Canadian and U.S. industries was found.

The development of a quantitative concordance was based on a project involving the reclassification of large Canadian manufacturing establishments to the U.S. Standard Industrial Classification. Generally, the method for recoding establishments can be summarized in two steps:

1) each commodity produced by a Canadian manufacturing establishment was linked to the relevant U.S. four-digit industry class

2) the establishment was then assigned the U.S. code corresponding to the largest share of its output (on the basis of 1988 shipments of Canadian establishments)

This recoding makes it possible to express Canadian manufacturing establishment data in either the Canadian or the U.S. classification structure. The criteria used to assign U.S. codes to Canadian establishments results in a concordance that defines comparability on the basis of similarity of commodity outputs. Comparable groups of industries from both U.S. and Canadian classifications are selected on the basis of 1988 Canadian shipments data, as illustrated below.

As the comparability measures are based on Canadian shipments data, the implicit assumption being made is that the U.S. commodity distribution is the same as the Canadian distribution. If the comparability measures were recalculated on the basis of U.S. shipments data rather than on Canadian data, it may generate different results. The difference between the two resulting concordances will be a function of the degree to which the industrial structures of the two countries differ. Because of limited data availability, it would be difficult to implement this methodology with U.S. data as this would require repeating the recoding exercise described above in the other direction (i.e. assigning Canadian codes to U.S. establishment data). Furthermore, the quality of the concordance should, in principle, be assessed at different points in time if this method is to be used to compare statistics over several years. When interpreting the results it is therefore important to keep in mind that the resulting concordance is representative of the *1988* structure of the Canadian economy.

Measures of comparability

The results of the recoding exercise described above were used to develop comparability measures between the two-digit U.S. manufacturing industries and Statistics Canada's multifactor productivity industry classes.

As explained at the beginning of the article, Statistics Canada's multifactor productivity estimates are produced at different levels of aggregation: total business sector and levels "PS", "PM", and "PL". The first step in measuring comparability was to aggregate 1988 shipments data for Canadian manufacturing establishments to the 19 manufacturing industry classes ("PM"). The second step involved the cross-tabulation of Canadian shipments data by Canadian PM industries and two-digit U.S. industries. The resulting shipments matrix thus contained the current dollar shipment value of the intersection between all possible pairs of Canadian and U.S. groups.

To illustrate how comparability was measured, let us define this matrix as **S**, with the 19 Canadian industries across the top and U.S. two-digit industries along the side. In the simple example depicted below, the **S** matrix shows the value of the intersections between Canadian industries (d,e,f,g,h,i,j) and U.S. industries (k,l,m,n,o,p,q).

Shipments(S)

$$
\begin{array}{cc}
 & \underline{PL} \\
 & \begin{array}{ccccccc} d & e & f & g & h & i & j \end{array} \\
\underline{USSIC}\ \begin{array}{c} k \\ l \\ m \\ n \\ o \\ p \\ q \end{array} &
\begin{bmatrix}
1 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 2 & 0 & 0 & 0 & 0 & 0 \\
0 & 3 & 0 & 0 & 0 & 0 & 0 \\
0 & 4 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 5 & 4 & 4 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 8 & 2 \\
0 & 0 & 0 & 0 & 0 & 10 & 0
\end{bmatrix}
\end{array}
$$

In order to understand how this matrix can be used to measure the quality of the concordance, it is helpful to consider the four possible cases that occur when comparing two classifications:

1) the *one-to-one* case: when there is a reciprocal correspondence between one group in each classification structure; in the example shown above, Canadian industry d and U.S. industry k fall under this category.

2) the *one-to-many* case: when one Canadian industry corresponds to a group of U.S. industries; Canadian industry e and U.S. industries l, m, and n are an example of a one-to-many case.

3) the *many-to-one* case: when a group of Canadian industries corresponds to a unique U.S. class; in the **S** matrix above, Canadian industries f, g, and h correspond exactly to industry o from the U.S. classification.

4) the *many-to-many* case: when a group of Canadian industries corresponds to a group of U.S. industries; industries i and j from the Canadian classification correspond to industries p and q in the U.S. classification.

The presence of non-zero values in off-diagonal elements of the shipments matrix **S** makes it possible to distinguish between the four occurrences described above. In reality, the vast majority of cases are "many-to-many" situations. In theory, industries should be aggregated together until all cases are reduced to one-to-one cases (i.e. 100% comparability). For example, the **S** matrix shown above indicates that by aggregating Canadian industries i and j together and by aggregating U.S. industries p and q together, the comparison of the two groups is equivalent to a one-to-one situation. In practice, the classification structures are so different that in most cases, it is not possible to arrive at a one-to-one case without having to aggregate all manufacturing industries together and even in that case, as will be explained below, the two manufacturing groups are not perfectly comparable.

The choice to aggregate industries in order to achieve comparability was based on the following decision rules: for each Canadian industry, U.S. classes are selected and aggregated together in a way that these U.S. classes have at least 90% of their *combined* shipments in common with the Canadian class[13]. In turn, if the U.S. industries that are chosen make up more than 90% (taken together) of the Canadian industry, then the groups of industries are considered to be reasonably comparable.

The example below illustrates how the aggregation decisions were made. The shipments matrix **S** below is a subset of the shipments matrix above and shows the value of shipments of goods and services common to both Canadian industries i and j and U.S. industries p and q. Let us define the vectors of marginal totals: **c** being the summation of shipments over all U.S. industry groupings (i.e. sum of all rows or total Canadian shipments by Canadian industry) and **u** being the summation of shipments over all Canadian PM's (i.e. sum of all columns or total Canadian shipments distributed by U.S. industry class).

[13] *Any U.S. industry (however small) having more than 80% of its shipments classified to a given Canadian industry class was assigned to that class even if the 90% coverage of the Canadian industry could be achieved without including it.*

Shipments(S)

$$\begin{array}{cc} & \begin{array}{cc} i & j \end{array} \\ \begin{array}{c} p \\ q \end{array} & \begin{bmatrix} 8 & 2 \\ 10 & 0 \end{bmatrix} \begin{bmatrix} 10 \\ 10 \end{bmatrix} u \\ & \begin{bmatrix} 18 & 2 \end{bmatrix} \\ & c \end{array}$$

Canadian share(A) *U.S. share(B)*

$$\begin{array}{cc} & \begin{array}{cc} i & j \end{array} \\ \begin{array}{c} p \\ q \end{array} & \begin{bmatrix} .44 & 1 \\ .56 & 0 \end{bmatrix} \end{array} \qquad \begin{array}{cc} & \begin{array}{cc} i & j \end{array} \\ \begin{array}{c} p \\ q \end{array} & \begin{bmatrix} .8 & .2 \\ 1 & 0 \end{bmatrix} \end{array}$$

Let us also define matrices **A** and **B** which contain the comparability measures:

→the Canadian share matrix (**A**) is defined as the ratio between the shipments in each cell of the **S** matrix and the total shipments by Canadian industry in vector **c**; for a given Canadian industry, the columns of matrix **A** show the distribution of the Canadian industry's shipments across U.S. industry classes.

→the U.S. share matrix (**B**) was defined as the ratio between the shipments in each cell of the **S** matrix and the total shipments by U.S. industry found in vector **u**; the rows of the resulting U.S. share matrix **B** represent the distribution of shipments belonging in a given U.S. industry over all Canadian industry groups.

To find the U.S. industry that corresponds to Canadian industry i, the matrix **S** shows that the ten shipment units classified to q are also classified to i (i.e. the share in matrix **B** is 1). The i and q combination therefore satisfies the 90% criteria in the U.S. dimension. However, the definition of U.S. industry q covers only slightly more than half of the production classified to Canadian industry i (see matrix **A**). Therefore, the two industries are not comparable. Looking at industry p, matrix **B** shows that only 80% of its production belongs in industry i in the Canadian classification. But taken together, 90% of the shipments classified to industries p <u>and</u> q also belong in industry i as can be seen in matrix **S** (i.e. (8+10)/(10+10) = 0.9). Moreover, this combination of U.S. industries covers 100% of industry i as can be seen in matrix **A** (i.e. 0.44 + 0.56).

To preserve the maximum amount of detail in the Canadian estimates, preference was given to aggregating U.S. groups together to achieve a concordance rather that grouping Canadian industries together. If it was impossible to achieve a 90% coverage of the Canadian industry by grouping U.S. industries without jeopardizing the U.S. share criteria, then the only solution was to aggregate Canadian groups together. Of course, there are cases where the definition of U.S. industries cross so many Canadian industry definitions, that the only way to find a comparable industry would be to aggregate together all manufacturing industries. This option is not used as all the detail of the comparison would be lost.

Since the recoding was done for Canadian manufacturing establishments only, the shipments of any Canadian establishment that is outside the Canadian manufacturing group but would theoretically belong in the U.S. manufacturing group are excluded from the shipments matrix. When this occurs, the comparability measure (i.e. the U.S. share) is biased upwards because the total Canadian shipments distributed over U.S. industry classes is underestimated by the value of shipments from non-manufacturing establishments which were not part of the recoding exercise. This occurs in three instances but only in one case is the impact significant: the Canadian logging and forestry industry (Canadian SIC 04) is a non-manufacturing industry in Canada but belongs in U.S. SIC 24 (Lumber and wood products) of the U.S. manufacturing group. To correct this problem, the logging and forestry industry was combined with the wood industries in the Canadian estimates, making this group comparable to the U.S. lumber and wood products industry. At the same time, this bridges the gap between the Canadian and the American manufacturing group definitions.

In the final analysis, it was found that ten out of nineteen Canadian manufacturing industries could be compared to one or many two-digit U.S. industries. For the remaining industries, aggregation on the Canadian dimension resulted in four additional "matches". There are two Canadian industries for which there is no reasonably comparable U.S. industry: the fabricated metal industry (PM 16) and other manufacturing industries (PM 23).

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FEATURE ARTICLE 2

Hours Worked: A New Measure of Labour Input for Multifactor Productivity Estimates

By Jean-Pierre Maynard[14]

Introduction

Although it is preferable to base the measure of multifactor productivity on estimates of person-hours worked for reasons that will be explained below, until now, productivity estimates have been based on the number of persons at work. Estimates of person-hours worked were developed in the framework of recent research on improvements into the quality of multifactor productivity measures.

In the framework of multifactor productivity, the productivity indices are first calculated at the most disaggregated level of industries, and then aggregated to the desired level following well-established rules. Despite the fact that estimates of hours worked were produced as part of the framework of labour productivity measurement, they were available only at higher levels of aggregation and could not therefore be of use in the calculation of multifactor productivity indices. The goal of this research, the results of which are presented here, consists in the disaggregation of the existing hours data to a detailed level of industries.

Ideally, labour input should represent the quantity of effort rendered by all persons participating in the production process, irrespective of whether such effort is physical or intellectual in nature. As there is no precise measure of human effort in a work environment, approximations such as the number of employees or the number of person-hours are generally utilized.

The use of the number of persons at work as a labour input measure relies on the assumption that human effort is proportional to the number of workers. It is possible to refine this measure by taking into account the number of hours worked per person. The number of person-hours worked is more appropriate since it takes into account the fact that the number of hours worked per person changes over time and across industries. For example, we have observed over time a reduction in the standard work week and an increase in part-time work. Another advantage resides in the improvement of Canada-United States comparisons of multifactor productivity, given that the U.S. estimates are already based on the hours concept.

The article that follows begins with an overview of the evolution of hours worked per person in Canada since 1961, for the business sector and component industries. It is followed by a discussion of sources and methods employed to produce hours worked for the 110 industries of the multifactor productivity series.

[14] *The author wishes to thank the staff from Productivity Measures that contributed to this project. In particular, the author wishes to thank Monique Larose, Sëan Burrows, Vere Clarke, and Stéphane Maynard for their important contribution to the development of these estimations as well as Aldo Diaz, Marie Allard-Saulnier, and René Durand for their valuable comments on earlier drafts of this paper.*

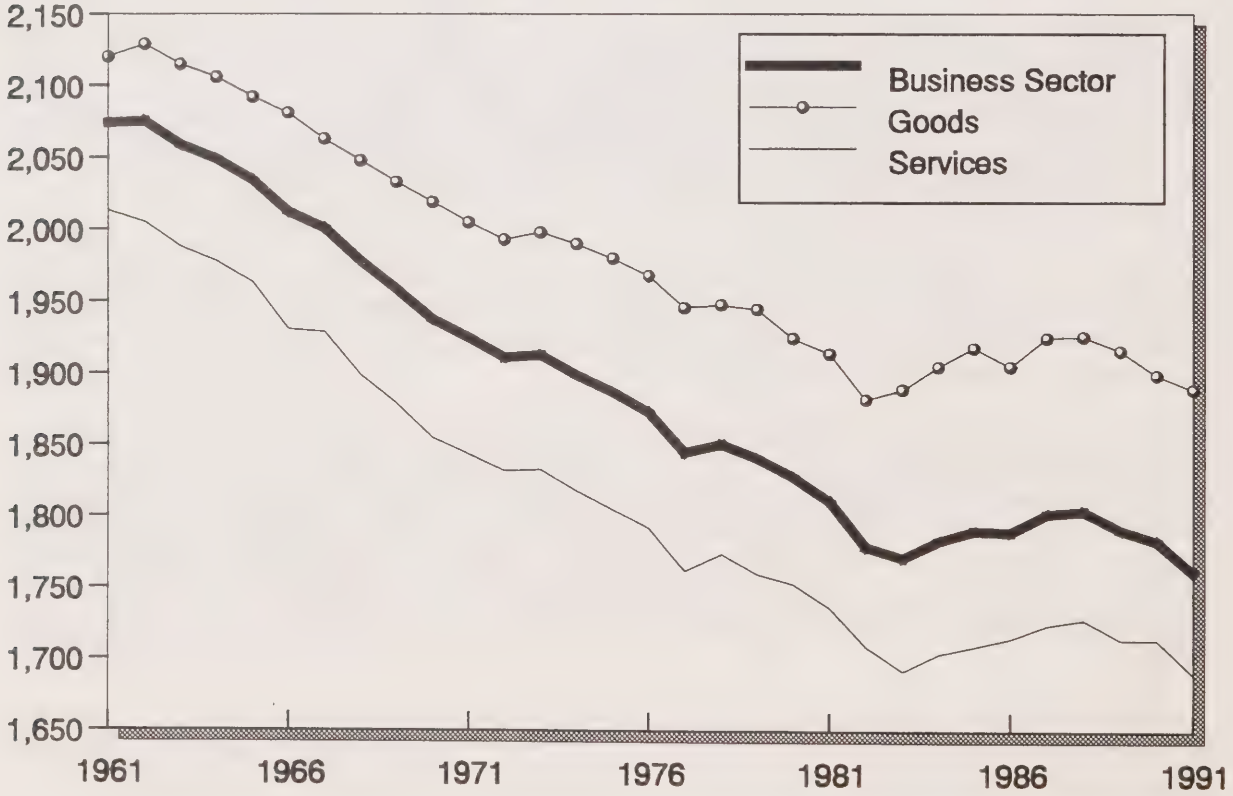
To the extent possible, the methodology is consistent with that used to produce the person-hours estimates at the aggregate level of industrial divisions for labour productivity. Finally, the article undertakes a comparison of multifactor productivity based on hours worked with those based on persons at work.

The Evolution of Hours Worked During the Last Thirty Years

Since the beginning of the 1960's, there has been an increase in leisure time as part of the general rise in living standards. Working conditions over the last thirty years improved considerably when measured in terms of number of hours worked per person. This reduction in hours per person is the result of gains in social benefits obtained by the work force such as increases in the length of vacation time, additional holidays, increases in paid leave for reasons of sickness or for personal reasons, or simply due to a generalized reduction in the standard work week. Figure 1 shows the downward trend in annual hours worked per person in the business sector as well as in the goods and services industries of the business sector.

Figure 1

Evolution of annual hours worked per person since 1961



It is of interest to note that the rate at which annual hours per person decreases has slowed considerably at the beginning of the 1980's. This observation is confirmed by the comparison of growth rates for different sub-periods presented in Text table 1. In fact, beginning with the 1982 recession, the decline in hours per person stops, and in fact increases between 1983 and 1988, only to decline starting in 1989. The reduction in the number of hours per person observed between recessions (1982 and 1990-1991) compensates for the rise which took place during the years of expansion (1983 to 1988).

Text table 1

Hours worked per person per year between 1961 and 1991 and selected sub-periods

Period	Business Sector	Business Sector Goods	Business Sector Services
1961-1975	-0.7%	-0.5%	-0.8%
1975-1982	-0.8%	-0.7%	-0.8%
1982-1991	-0.1%	0.0%	-0.1%
1961-1991	-0.5%	-0.4%	-0.6%

Annual hours worked per person show a net tendency to decline during the period of study, indicating that multifactor productivity estimates would be sensitive to the use of person-hours as labour input.

Concepts and Definitions

The concept of hours worked that is of interest to us represents the total number of hours that a person devotes to work, whether these hours are paid or not. Generally, this includes normal hours plus overtime, including coffee breaks, on-the-job training as well as time lost due to unanticipated interruptions in production. Time lost due to strikes or lockouts, to statutory holidays, vacations, illness, maternity leave or personal reasons is not included in hours worked.

Statistics Canada's Input-Output Division currently maintains a detailed database of employment statistics which distinguishes between paid workers and other-than-paid workers. Some surveys collecting data on employment usually differentiate between production and other salaried employees (administrative personnel, office workers, sales representatives, etc.). The other-than-paid workers class can also be broken down into two types: self-employed workers, including working owners and active associates, and unpaid family workers. The latter type is mostly found in industries where family businesses are prevalent, such as the agriculture industry and the retail trade industry. Text table 2 shows the classes of workers used in this study.

Text table 2

Diagram of classes of workers used to estimate labour input for the calculation of productivity

Persons at Work

- Paid Workers
  - Production Workers
  - Other Salaried Employees
- Other-than-paid Workers
  - Self-employed Workers
  - Unpaid Family Workers

For the purposes of this project, estimates of person-hours worked were produced for the relevant classes of workers from 1961 to the present and for 110 industries. The person-hours worked concept can be visualized as the product of hours worked per person as defined above, and the average number of persons at work. As the number of persons at work is already available in a database, the project consisted of producing estimates of annual hours worked per person which would be representative of all classes of workers in each industry.

Description of Sources and Methods

At Statistics Canada, there is no single source of information which would allow the estimation of hours worked per person for all industries and for the full period under consideration. Time series on annual hours worked per person were therefore constructed from four main sources:

1) the Annual Survey of Manufactures
2) the Labour Force Survey
3) the Census of Mines
4) the Annual Survey of Working Conditions

For most industries, more than one source is available. Notwithstanding the fact that the data must be compatible with the concept of hours worked used for multifactor productivity, we privileged data sources that: 1) were considered to be the most reliable; 2) were available for the entire period; 3) were already used in the employment estimates.

1 - Manufacturing Industries

In the case of manufacturing industries, the main source for person-hours worked was the Annual Survey of Manufacturing[15]. In 1989, these data were collected annually using three different methods. All large establishments including head offices are surveyed by means of a fully detailed questionnaire. Small establishments are surveyed on a rotating basis by means of a simplified questionnaire and by means of

[15] *For more information concerning this survey, see Manufacturing Industries of Canada: national and provincial areas, Statistics Canada, catalogue no. 31-203 annual.*

administrative records. Only large establishments are asked specific questions on hours paid and hours worked and this, only for production workers. This questionnaire also included additional questions on the hourly wage rate, on the normal number of hours worked, as well as on the annual average number of paid holidays for total paid workers. This survey uses the additional information obtained on the number of paid holidays and hours paid data to derive the number of hours at work. However, data on normal hours for other salaried employees were not collected prior to 1983.

As for the complement of small establishments, person-hours are estimated from declared wages and salaries. *Paid* person-hours are then obtained by dividing wages and salaries by average hourly earnings estimated from the data on large establishments in the same industry. The number of person-hours *worked* is calculated by the ratio of person-hours *worked* to person-hours *paid* for a given industry. The estimates of hours worked for small establishments are of a lower quality; however, these establishments only accounted for a small proportion of the total shipments of manufacturing industries in 1989[16] .

The Annual Survey of Manufactures provides the necessary hours worked information at the detailed level in the case of production workers[17]. Data on person-hours worked at the major group level (level "PM")[18] for the four classes of workers are already produced in the framework of the labour productivity program. Annual hours worked per person for other salaried employees, self-employed and unpaid family workers were available only at the PM level for the entire period. Estimates of hours worked for these three groups at the detailed PL level were produced on the assumption that within each PM group, all employees worked the same number of hours on average. This means that differences found in the number of hours worked per person at the PL level within manufacturing strictly reflect differences in the hours worked by production workers[19].

2 - Non-Manufacturing Industries

For non-manufacturing industries, the number of hours worked per person are taken at least in part from the Labour Force Survey. As in the case of manufacturing, the estimates are constructed separately for paid workers and other-than-paid workers, that is, self-employed workers and unpaid family workers. Statistics on hours worked for the two classes of workers and for most of the 110 industries at the PL level are available starting in 1975, when the survey underwent a major redesign. Previously, the industrial coding of this survey was limited to industrial divisions (PS level). Another source was used for the years 1961 to 1975 for most industries.

The definition of five of the 110 industries coincide with the industrial divisions for which estimates of hours worked are produced in the framework of the labour productivity measures. These industries are: Agricultural and Related Services, Fishing and Trapping, Logging and Forestry, Construction, and Finance, Insurance and Real Estate. Therefore, the time series on hours worked for these industries are taken directly from the labour productivity program.

[16] *According to detailed information from the 1989 Annual Survey of Manufactures large establishments represented 90% or more of the industry shipments in 48 of the 83 groups. In addition, this number reached 77 (93%) when we consider establishments representing at least 70%. Only six industries had a share of small establishments that was greater than 30%.*

[17] *The 1986-1987 growth rate of Labour Force Survey data was used to estimate the level of paid workers in manufacturing for 1987, the data on hours worked from the 1987 Annual Survey of Manufactures having not been edited.*

[18] *For more information on industrial aggregates as defined in the multifactor productivity measures, see Appendix 3 in Part 2 of this publication.*

[19] *For more information on the methodology used to estimate hours for other salaried employees and other-than-paid workers, see Appendix 2 in Part 1 of this publication.*

Statistics on hours collected by the Labour force survey refer to a specific week in each month; usually the week of the 15th of the month. This survey includes a series of questions on the number of hours worked which are asked to any respondent having worked during the reference week. These questions pertain to usual hours, overtime, hours actually worked, as well as hours lost and reasons for absences from work. This information facilitates the verification of each element of information on hours worked for consistency and allows the estimation of the total annual number of hours worked. As the statistics from this survey pertain to a specific week of the month, the annual data only represent the twelve weeks of the year that were surveyed. In order to produce annual data that would be representative of the hours actually worked during all weeks of the year, the Productivity Measures Section developed a methodology. The purpose of this methodology is to adjust the hours actually worked as reported by the survey to account for two random factors; the statutory holidays that may or may not fall in the reference weeks in a given year and the impact of days lost due to labour disputes[20].

The method used to produce the annual estimates of hours worked from Labour Force Survey data can be summarized in four steps[21].

1 - The first consists of adding to the estimates of hours worked for the survey week, the hours lost due to a statutory holiday or to a labour dispute. The result is therefore an estimate of hours worked under the assumption of no statutory holidays or labour disputes. These data are then interpolated between the survey weeks in order to produce the estimates for the fifty-two weeks of the year.

2 - The second step consists of adjusting, if necessary, the hours worked in the year for time lost due to statutory holidays. When the holidays are in the survey week, the estimates for hours worked are taken directly from the survey data, otherwise, they are estimated using the following method. The main statutory holidays in Canada were identified and classified in three categories: (1) Major (Christmas Day, New Year's Day, Good Friday, Canada Day, Labour Day, and Thanksgiving; (2) Major-Minor (Victoria Day, Boxing Day); and (3) Minor (Easter Monday, St-Jean Baptiste, August Civic Holiday, and Remembrance Day)[22]. This classification reflects the fact that most employees are entitled to the major holidays whereas a smaller proportion are granted the other holidays. The number of working hours lost for the three categories of holidays is estimated from the hours lost in survey weeks for the corresponding category of holidays.

3 - Thirdly, all hours lost due to labour disputes are removed from the estimates of hours worked.[23] Only the hours worked by paid workers are adjusted for this type of absence.

4 - Finally, annual hours worked per person per week are calculated as the average of the weekly values adjusted for strikes and holidays. The number of hours worked per year is simply the weekly average multiplied by the number of weeks in the year. The number of weeks in the year is not taken as constant, but reflects the variations in the calendar. A calendar year

[20] *The employment concept of the Labour Force Survey includes as employees, any respondents that did not work during survey week due to labour disputes.*

[21] *For a complete description of this methodology, see Maryanne Webber, "Estimating Total Annual Hours Worked from the Canadian Labour Force Survey", Input-Output Division, Technical Series number 51, April 1983.*

[22] *The classification of statutory holidays in order of importance comes from data collected by the Pay Research Bureau, a service of the Public Service Staff Relations Board of the Federal Public Service.*

[23] *For more information concerning this survey, refer to Collective Bargaining Review, Labour Canada, monthly.*

includes 52 complete weeks plus one day (two in leap years). If these extra days fall on a normal day of rest, the year is considered to have 52 weeks even. If not, the number of weeks is greater. Calendar year variations account for up to 0.4% in the year-to-year change in hours worked.

Using this method, estimates of hours worked per person were produced for paid workers, except for Mining Industries and Manufacturing Industries, and for other-than-paid workers for all industries with the exception of Manufacturing.

As mentioned, the data on hours actually worked from the Labour Force Survey did not exist prior to 1975 at the level of aggregation needed. For the years prior to 1976, data from the Survey on Working Conditions[24] were used. This survey, cancelled in 1984, was an annual survey which covered all establishments of twenty or more employees in Canada with the exception of the Agricultural and Related Services Industries, Fishing and Trapping, and Construction. The purpose of this survey was to collect information on the working conditions in establishments. The survey collected, among other things, information of normal work hours, paid statutory holidays, annual leave, and sick leave. This information was produced for most industries that were needed and distingued between production workers ("non-office employees") and other salaried employees ("office employees").

From this information, annual data on normal working hours were derived, from which hours paid for statutory holidays and annual leave were deducted. Data on working conditions for paid annual leave were shown according to specific eligibility criteria. For example, for a given industry, the statistics were tabulated by the number of years of service required to be eligible for three weeks instead of two weeks of annual leave. In order to produce estimates of average hours on holidays for each industry, this information was combined with the estimates of job tenure from the Labour Force Survey[25].

Since the estimates of hours worked per person by paid workers were obtained from the Labour Force Survey starting in 1976 and from the Survey of Working Conditions up to 1975, the two time series had to be linked together. The series originating in the latter survey was multiplied by the average of the difference between the two series for the years 1975 to 1978. Then, since the hours obtained from the Survey of Working Conditions did not correspond exactly to our concept of hours worked[26], they were linked to the corresponding estimates for paid workers at the industry division level (PS) that are presently used in the calculation of labour productivity estimates.

The data on hours worked for each of the four mining industries were produced using a different methodology. The total person-hours worked for the Mining (including milling), Quarrying and Oil Well Industries used in labour productivity was allocated to the four industries according to the distribution of hours paid from the Census of Mines. These statistics cover the entire period but represent only production workers. Since these are estimates of hours paid, paid holidays (statutory and annual leave) estimated from the Survey of Working Conditions were subtracted from them. This survey having been cancelled in 1984, the estimates of paid holidays were extrapolated along a linear trend until 1989. In order to reflect all paid workers in this industry, the total person-hours for this division was used as a benchmark for the entire period and distributed according to the value share of each component estimated from the person-hours of the Census of Mines.

[24] *For more information on this survey, see the technical notes in annual reports from Working Conditions in Canadian Industry, Labour Canada, 1961-1984.*

[25] *For further details on the "job tenure" variable, see User's Guide to the Labour Force Survey Data, catalogue no. 71-528, Statistics Canada, 1992, pp. 13 and 36.*

[26] *In contrast with the Labour Force Survey which is a household survey, most establishment surveys only collect information on standard working hours for the non-production classes of workers .*

For the paid workers of the Pipeline Transport Industry, the Educational Services and Other Health Services industries, there was simply no data before 1976. We therefore used the growth of hours per person from industries exhibiting similar trends from 1976 to 1991. In the case of Pipeline Transport, hours worked per person from the Crude Petroleum and Natural Gas Industries were used. The hours worked per person in Hospitals were used to estimate the two other industries.

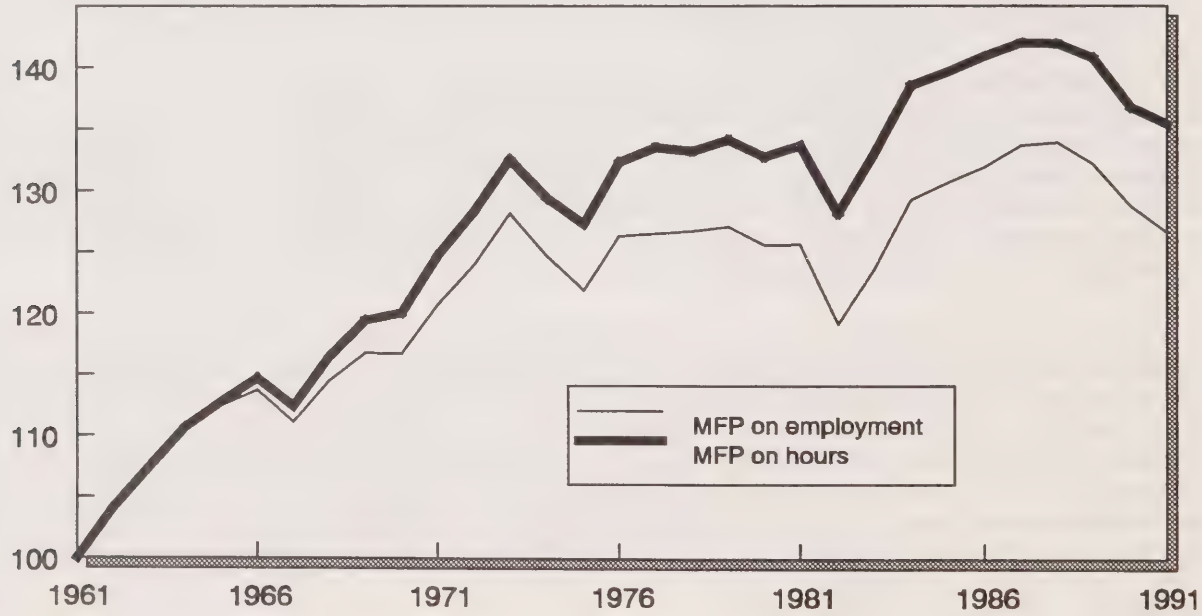
Since the Labour Force Survey is the only source available to produce estimates on other types of workers for all non-manufacturing industries, there are no detailed data prior to 1976. The share of hours worked to self-employed and unpaid family workers were therefore estimated for each industry using backward linear extrapolation of the Labour Force Survey data from 1976 to 1991. The results obtained were then reconciled with the person-hours estimates at the corresponding industry division level (PS).

The use of aggregate data (PS level) for person-hours from the labour productivity measures program also allows us to ensure the consistency of the results from the various productivity measures produced.

Impact of Hours Worked on the Measurement of Multifactor Productivity

Figure 2

Comparison between multifactor productivity indices based on person-hours worked and persons at work, business sector, 1961-1991



The use of hours worked instead of persons at work as the measure of labour input has the effect of increasing multifactor productivity based on value-added for the business sector by an average of 0.2% per year during the 1961-1991 period (see Figure 2). In other words, the use of hours worked increases multifactor productivity growth by about 30% over the three decades. However, the impact of person-hours worked on productivity estimates changes considerably from period to period and across industries.

Estimates of productivity growth rates[27] corresponding to person-hours worked and to persons at work are shown in Text table 3 for different sub-periods determined by the cyclical troughs of the multifactor productivity index for the business sector. The use of the number of persons as labour input instead of the more precise person-hours measure is shown to have the effect of underestimating business sector multifactor productivity growth by 0.2% between 1961 and 1967 and by 0.4% between 1967 and 1982. It should be noted that the negative performance observed when persons is used between 1975 and 1982 turns to a slightly positive growth with the use of hours worked. As expected, given little change in hours worked per person during the 1982-1991 cycle, multifactor productivity based on hours worked is exhibiting a slightly lower growth rate compared to the rate based on persons at work during the period. In fact, as Figure 3 shows, the growth rate of multifactor productivity based on hours worked was lower than that on persons at work in six out of the last ten years. The same phenomenon occurred just three times between 1962 and 1982: in 1962, 1973, and 1978.

Text table 3

Comparison between multifactor productivity growth rates based on person-hours worked and persons at work, business sector, 1961-1991

Period	Persons at work	Person-hours worked	Differences
1961-1991	0.8%	1.0%	0.2
1961-1967	1.8%	2.0%	0.2
1967-1975	1.2%	1.6%	0.4
1975-1982	-0.3%	0.1%	0.4
1982-1991	0.7%	0.6%	-0.1

Figure 4 shows a very different impact across industrial divisions when hours worked are used instead of persons at work. With the exception of the Finance, Insurance and Real Estate Industry, all service industries show an increase in productivity larger than 0.1% when calculated on hours worked, with Retail Trade showing the largest impact. At lower aggregation levels, the Railway Transportation Industry, Road, Highway and Bridge Maintenance Industry, Pipeline Transportation, and the Telecommunications Industry show little productivity improvements when calculated on hours worked.

[27] *Given the methodology to estimate multifactor productivity, the labour input measure which should be used in analysis is not the sum of hours or employment but rather the weighted average of hours or employment calculated using the Törnqvist index number formula.*

Among the goods-producing industries of the business sector, Agriculture, Fishing and Trapping as well as Logging and Forestry show a net productivity improvement when based on hours. Few improvements were recorded in the Mining Industries, in Total Manufacturing, and in the Construction Industry. In addition, a detailed analysis of individual manufacturing industries shows significant long term differences in only 13 of 83 cases. In all other manufacturing industries, the impact was less than 0.1%, whether negative or positive. Nine of the industries for which the impact was significant exhibited a substantial improvement in productivity. This is the case in the following industries:

- Construction, Shipbuilding and Repair Industry;
- Aircraft and Aircraft Parts Industry;
- Wool Yarn and Woven Cloth Industry;
- Clay Products Industry;
- Cement Industry;
- Non-Ferrous Smelting and Refining;
- Carpet, Mat and Rug Industry and;
- Other Electrical and Electronic Products.

Otherwise, the other four industries exhibit a deterioration in multifactor productivity growth. This occurred in Office, Store and Business Machines, Platemaking, Typesetting and Bindery, Iron Foundries and Record Players, Radio and T.V. Receivers.

Figure 3

Annual growth of multifactor productivity for the business sector

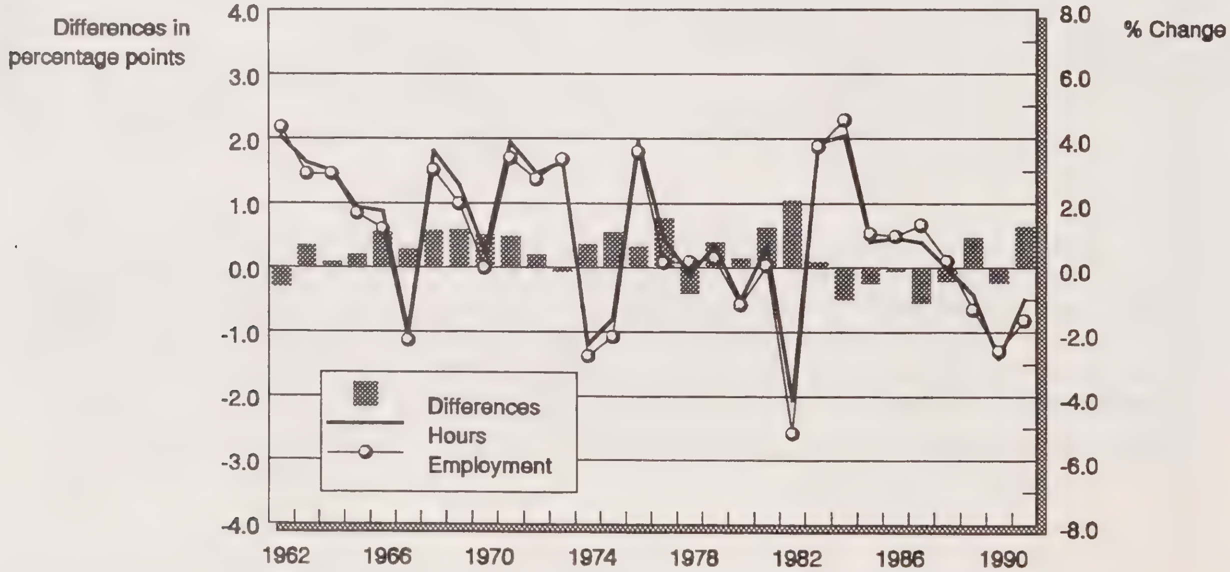
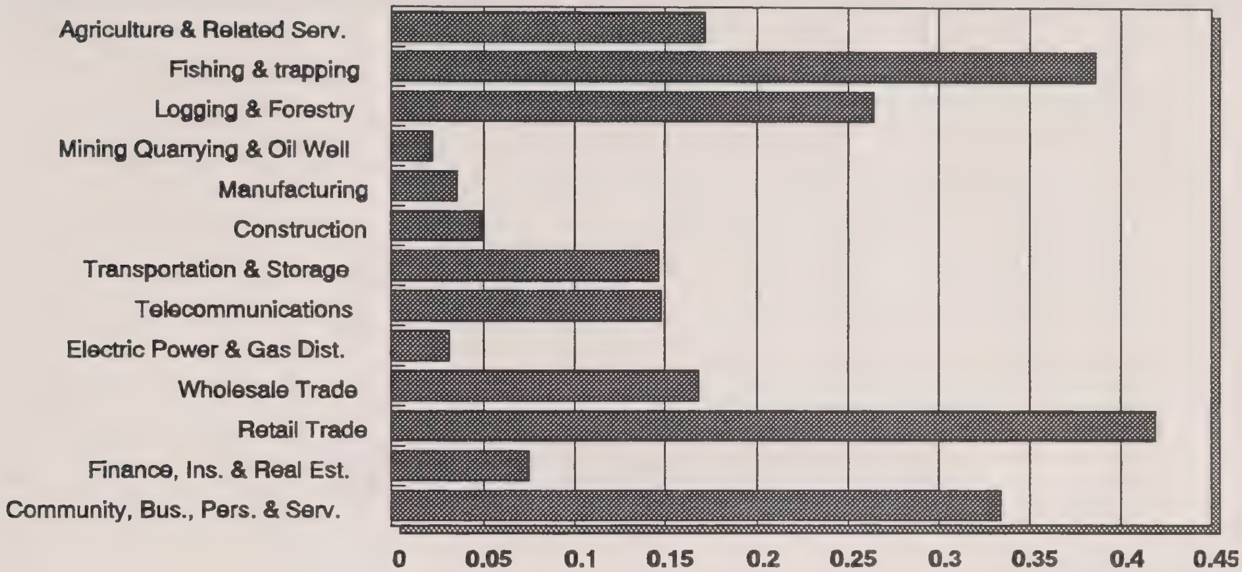


Figure 4

Differences between productivity growth rates based on hours worked and on employment, by industry, 1961-1991



In summary, the use of the more precise hours worked measure of labour input results in a thirty percent increase in the long term growth rate of business sector multifactor productivity. The estimates for total manufacturing are less sensitive, showing an increase of only 6% over thirty years. For the business sector and most of its industries, the impact took place entirely in the 1961-1982 period; the new data has no impact on the estimates for the 1982-1991 cycle as compared to the employment-based measures.

PART 1

Labour Productivity

Labour Compensation

Unit Labour Cost

Table 1 - Indices of labour productivity and unit labour cost, business sector industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1971	57.7	69.4	74.6	20.0	83.1	77.3	28.8	26.8	34.7
1972	61.2	71.6	76.5	22.2	85.5	80.0	31.1	29.1	36.3
1973	66.7	75.3	80.5	25.9	88.6	82.8	34.4	32.2	38.9
1974	69.0	79.0	83.9	30.8	87.3	82.2	38.9	36.7	44.6
1975	69.3	80.2	84.6	35.4	86.4	81.9	44.1	41.8	51.0
1976	74.0	81.5	85.3	40.7	90.8	86.7	50.0	47.7	55.0
1977	76.4	83.3	85.9	45.1	91.7	88.9	54.2	52.5	59.1
1978	78.9	85.9	88.9	49.2	92.0	88.8	57.3	55.4	62.3
1979	82.4	89.5	92.1	55.5	92.1	89.5	62.1	60.3	67.4
1980	83.8	91.4	93.5	62.8	91.7	89.7	68.7	67.2	74.9
1981	87.5	94.2	95.4	72.4	92.8	91.7	76.8	75.9	82.8
1982	82.6	91.3	90.9	75.8	90.4	90.9	83.0	83.5	91.8
1983	85.5	91.3	90.4	79.1	93.7	94.6	86.6	87.5	92.5
1984	91.5	93.7	93.4	85.9	97.7	98.0	91.7	92.0	93.9
1985	96.6	98.1	98.1	93.6	98.5	98.5	95.5	95.4	96.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.0	103.2	104.0	109.9	101.7	101.0	106.5	105.7	104.7
1988	110.1	107.2	108.2	121.6	102.7	101.8	113.4	112.4	110.4
1989	112.3	109.7	109.9	131.7	102.4	102.2	120.0	119.8	117.2
1990	111.0	110.3	109.9	137.9	100.7	101.0	125.1	125.5	124.2
1991	108.5	107.2	105.5	139.9	101.3	102.8	130.5	132.5	128.9

Table 2 - Indices of labour productivity and unit labour cost, business sector-excluding agricultural & related services industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	56.8	67.4	71.6	19.9	84.3	79.3	29.5	27.7	35.0
1972	60.9	70.1	74.3	22.2	86.8	82.0	31.6	29.8	36.4
1973	66.3	74.2	78.6	25.8	89.3	84.4	34.7	32.8	38.8
1974	68.9	78.1	82.1	30.6	88.3	83.9	39.2	37.3	44.5
1975	68.9	79.0	82.3	35.2	87.3	83.7	44.6	42.8	51.2
1976	73.6	80.5	83.4	40.7	91.4	88.2	50.5	48.8	55.3
1977	76.1	82.5	84.5	45.1	92.2	90.0	54.7	53.4	59.3
1978	78.8	85.0	87.6	49.1	92.6	90.0	57.7	56.0	62.3
1979	82.6	88.8	90.9	55.5	93.0	90.9	62.5	61.1	67.2
1980	83.9	90.9	92.7	62.8	92.3	90.5	69.1	67.8	74.9
1981	87.4	93.8	94.7	72.3	93.2	92.3	77.1	76.4	82.8
1982	82.0	90.9	90.1	75.7	90.2	91.1	83.3	84.1	92.3
1983	85.2	90.6	89.6	79.0	94.0	95.1	87.1	88.2	92.7
1984	91.6	93.2	92.8	85.9	98.3	98.7	92.1	92.5	93.7
1985	97.1	97.9	97.8	93.5	99.3	99.4	95.6	95.7	96.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.5	103.5	104.4	110.2	101.9	101.0	106.4	105.5	104.5
1988	111.0	108.0	109.3	121.9	102.8	101.5	112.9	111.5	109.8
1989	113.0	110.8	111.3	132.1	102.0	101.5	119.2	118.6	116.9
1990	111.3	111.3	111.2	138.3	100.0	100.1	124.3	124.4	124.3
1991	108.7	108.1	106.5	140.2	100.6	102.0	129.7	131.6	128.9

Table 3 - Indices of labour productivity and unit labour cost, business sector-services, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	50.5	56.4	60.7	17.5	89.5	83.2	31.0	28.8	34.6
1972	54.2	59.6	63.6	19.8	91.0	85.2	33.2	31.1	36.5
1973	58.3	63.4	67.7	22.9	92.1	86.2	36.1	33.8	39.2
1974	61.8	67.7	71.8	27.4	91.2	86.0	40.4	38.2	44.3
1975	64.4	70.1	73.8	32.0	91.9	87.3	45.7	43.4	49.7
1976	68.0	71.6	74.8	37.0	94.9	90.8	51.6	49.4	54.4
1977	70.0	74.9	77.0	41.2	93.5	91.0	55.0	53.6	58.9
1978	73.7	78.1	80.8	45.2	94.4	91.2	57.9	56.0	61.4
1979	77.9	81.7	83.8	51.5	95.3	92.9	63.0	61.4	66.1
1980	81.3	84.9	86.8	59.1	95.7	93.7	69.6	68.0	72.6
1981	84.8	88.9	90.0	67.6	95.4	94.2	76.1	75.1	79.7
1982	81.0	88.5	88.2	73.3	91.6	91.9	82.9	83.2	90.5
1983	83.3	89.1	88.0	77.2	93.4	94.7	86.6	87.7	92.6
1984	89.2	92.3	91.7	84.9	96.6	97.2	92.0	92.6	95.2
1985	94.6	97.6	97.2	93.0	97.0	97.3	95.3	95.7	98.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.8	103.6	104.2	110.9	102.1	101.5	107.0	106.5	104.8
1988	111.6	107.7	108.5	122.6	103.6	102.8	113.9	113.0	109.9
1989	114.9	110.7	110.7	133.6	103.8	103.9	120.7	120.7	116.3
1990	114.9	113.0	112.9	142.6	101.7	101.8	126.3	126.3	124.1
1991	114.1	112.2	110.5	148.4	101.7	103.2	132.3	134.3	130.0

Table 4 - Indices of labour productivity and unit labour cost, business sector-goods, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	65.7	89.8	94.6	23.2	73.2	69.5	25.8	24.5	35.3
1972	69.1	90.7	94.9	25.4	76.2	72.8	28.0	26.8	36.8
1973	76.2	94.3	98.9	29.8	80.8	77.0	31.6	30.2	39.1
1974	77.0	96.9	101.2	35.1	79.4	76.1	36.2	34.7	45.6
1975	74.6	96.3	100.0	39.7	77.5	74.6	41.2	39.7	53.2
1976	80.6	97.1	100.3	45.5	83.0	80.4	46.9	45.4	56.4
1977	83.5	96.7	98.8	50.2	86.3	84.5	51.9	50.8	60.1
1978	84.6	98.1	100.3	54.3	86.2	84.3	55.3	54.1	64.1
1979	87.3	101.9	104.0	60.7	85.7	83.9	59.6	58.4	69.6
1980	86.2	101.8	102.9	67.5	84.7	83.8	66.4	65.6	78.3
1981	90.0	102.7	103.2	78.5	87.6	87.2	76.5	76.1	87.3
1982	84.0	95.9	94.7	79.0	87.7	88.8	82.4	83.4	94.0
1983	87.5	94.6	93.8	81.5	92.5	93.3	86.1	86.9	93.1
1984	93.7	95.8	95.8	87.3	97.8	97.8	91.0	91.1	93.1
1985	98.5	98.8	99.4	94.5	99.7	99.0	95.6	95.0	95.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.1	102.6	103.6	108.6	101.5	100.4	105.9	104.8	104.4
1988	108.6	106.6	107.7	120.4	101.9	100.9	113.0	111.8	110.8
1989	109.6	108.2	108.8	129.2	101.3	100.7	119.4	118.7	117.9
1990	106.8	106.0	105.6	131.8	100.8	101.1	124.4	124.8	123.4
1991	102.5	99.2	98.4	128.9	103.3	104.2	129.9	131.0	125.7

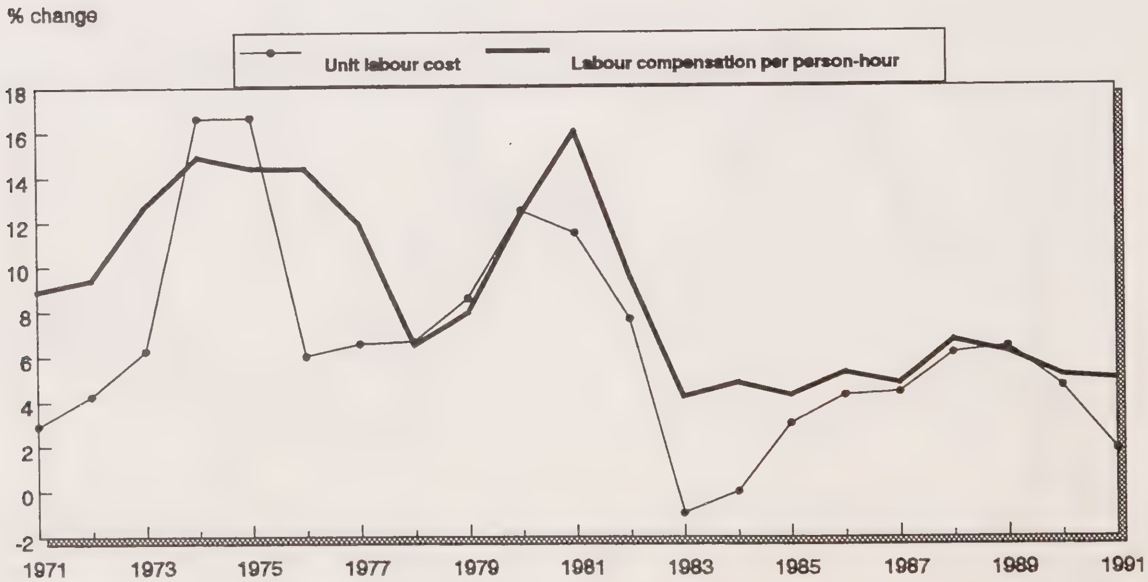


Table 5 - Indices of labour productivity and unit labour cost, agricultural & related services industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1971	84.8	101.6	114.1	24.5	83.5	74.4	24.1	21.5	28.9
1972	72.2	95.6	105.7	25.0	75.5	68.3	26.1	23.6	34.6
1973	79.3	92.9	105.7	32.4	85.4	75.0	34.9	30.6	40.8
1974	69.6	94.1	107.5	35.3	74.0	64.8	37.6	32.9	50.8
1975	81.3	100.3	114.5	40.1	81.0	71.0	40.0	35.0	49.3
1976	88.5	97.9	110.3	41.8	90.4	80.2	42.7	37.9	47.3
1977	87.5	96.8	105.0	46.1	90.4	83.3	47.6	43.9	52.6
1978	83.8	99.1	105.8	53.5	84.6	79.2	54.0	50.6	63.9
1979	77.0	100.8	108.7	56.9	76.3	70.8	56.4	52.4	73.9
1980	81.5	100.3	103.9	60.3	81.3	78.5	60.2	58.0	74.0
1981	88.9	101.9	105.2	75.3	87.2	84.5	73.9	71.6	84.8
1982	94.5	97.5	101.0	80.0	96.9	93.5	82.1	79.2	84.7
1983	91.7	101.7	101.1	82.9	90.2	90.7	81.5	82.0	90.4
1984	88.8	101.5	100.9	88.6	87.4	88.0	87.3	87.8	99.8
1985	85.1	101.4	103.2	98.7	83.9	82.5	97.3	95.7	116.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	90.1	98.1	97.9	99.1	91.9	92.1	100.9	101.2	109.9
1988	85.5	95.4	92.7	109.8	89.6	92.2	115.2	118.5	128.5
1989	91.8	92.5	90.9	115.0	99.3	100.9	124.3	126.4	125.2
1990	102.3	93.5	93.3	121.8	109.4	109.6	130.3	130.6	119.1
1991	102.5	92.3	92.1	126.7	111.1	111.3	137.3	137.6	123.6

Table 6 - Indices of labour productivity and unit labour cost, manufacturing industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	65.3	90.7	93.4	23.8	72.0	69.9	26.2	25.4	36.4
1972	70.6	93.5	96.3	26.3	75.5	73.3	28.2	27.3	37.3
1973	78.2	97.8	100.3	29.7	79.9	77.9	30.4	29.6	38.0
1974	80.5	99.8	101.7	34.6	80.7	79.2	34.7	34.1	43.0
1975	75.1	97.5	98.3	38.3	77.1	76.5	39.3	38.9	50.9
1976	80.6	97.9	98.6	43.9	82.3	81.8	44.8	44.6	54.5
1977	83.6	95.9	96.8	47.7	87.1	86.3	49.8	49.3	57.1
1978	87.4	98.9	100.1	53.2	88.3	87.3	53.7	53.1	60.8
1979	90.6	102.5	102.9	60.2	88.4	88.1	58.7	58.5	66.4
1980	86.6	102.2	102.2	66.2	84.7	84.7	64.8	64.8	76.4
1981	89.8	102.2	101.0	75.3	87.8	88.9	73.7	74.5	83.9
1982	78.2	94.3	92.2	75.9	82.9	84.8	80.6	82.4	97.1
1983	83.2	92.4	91.5	79.9	90.1	91.0	86.6	87.4	96.1
1984	94.0	95.2	95.2	87.2	98.7	98.7	91.6	91.5	92.8
1985	99.3	97.6	97.7	94.1	101.7	101.6	96.4	96.3	94.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.8	103.0	103.9	107.0	101.7	100.9	103.8	103.0	102.0
1988	110.2	107.5	108.7	116.8	102.4	101.4	108.6	107.5	106.1
1989	110.4	108.8	109.3	123.7	101.4	101.0	113.7	113.2	112.1
1990	104.7	103.6	102.8	123.9	101.1	101.9	119.6	120.6	118.3
1991	97.8	95.6	94.7	121.8	102.3	103.2	127.4	128.5	124.5

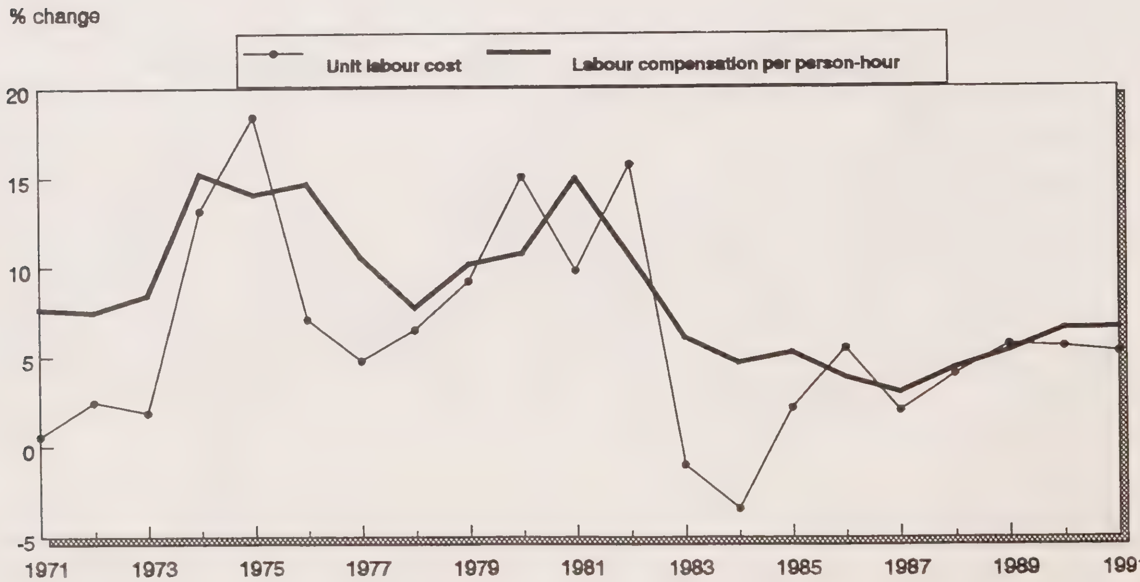


Table 7 - Indices of labour productivity and unit labour cost, construction industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	61.7	83.9	87.1	24.0	73.5	70.8	28.7	27.6	39.0
1972	61.7	85.8	89.4	26.2	71.9	69.0	30.5	29.3	42.5
1973	63.5	91.4	95.6	32.7	69.5	66.5	35.8	34.2	51.5
1974	65.5	96.4	100.8	39.6	68.0	65.0	41.1	39.3	60.5
1975	72.7	94.8	98.5	47.1	76.7	73.8	49.7	47.8	64.8
1976	81.9	99.9	102.8	54.6	82.0	79.6	54.7	53.1	66.7
1977	86.1	101.4	101.7	60.5	84.9	84.6	59.7	59.5	70.3
1978	81.8	98.5	100.0	59.7	83.0	81.8	60.6	59.7	73.0
1979	82.6	103.2	105.4	63.7	80.1	78.4	61.7	60.4	77.0
1980	86.8	101.5	104.3	72.7	85.5	83.3	71.7	69.8	83.8
1981	96.7	103.2	105.0	88.4	93.7	92.1	85.6	84.2	91.4
1982	96.8	96.7	93.0	84.9	100.1	104.0	87.9	91.3	87.8
1983	95.1	93.3	91.0	83.4	101.9	104.4	89.4	91.7	87.8
1984	89.1	91.4	90.6	84.6	97.5	98.3	92.6	93.4	95.0
1985	96.0	98.4	99.3	92.0	97.6	96.7	93.5	92.7	95.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.7	105.8	109.5	117.6	99.9	96.5	111.1	107.4	111.2
1988	109.7	113.6	118.9	134.8	96.6	92.3	118.7	113.4	122.9
1989	114.5	120.0	124.8	150.7	95.4	91.8	125.6	120.8	131.6
1990	115.1	122.5	123.7	157.6	94.0	93.1	128.7	127.4	136.9
1991	110.1	112.2	111.3	147.6	98.1	98.9	131.5	132.6	134.0

Table 8 - Indices of labour productivity and unit labour cost, transportation & storage industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compen-sation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compen-sation per person	Compen-sation per person-hour	Unit labour cost
1971	62.3	79.9	82.6	21.4	77.9	75.4	26.8	25.9	34.3
1972	66.2	81.7	83.7	24.1	81.0	79.1	29.5	28.8	36.4
1973	70.6	84.5	86.8	27.1	83.6	81.3	32.1	31.2	38.4
1974	73.7	89.6	91.8	32.4	82.3	80.3	36.2	35.3	44.0
1975	72.6	88.6	89.4	37.7	81.9	81.2	42.5	42.1	51.9
1976	72.1	87.8	88.6	42.1	82.1	81.4	48.0	47.5	58.4
1977	75.2	93.2	93.0	47.9	80.7	80.9	51.4	51.5	63.7
1978	79.0	95.2	96.1	53.0	83.0	82.2	55.7	55.2	67.1
1979	88.4	98.2	98.4	59.3	90.0	89.8	60.4	60.2	67.1
1980	85.3	102.7	103.7	66.9	83.0	82.3	65.1	64.5	78.4
1981	84.3	104.2	103.0	75.8	80.9	81.8	72.8	73.6	89.9
1982	79.6	98.7	96.8	79.8	80.6	82.2	80.8	82.4	100.2
1983	85.5	94.1	90.7	81.9	90.8	94.2	87.0	90.3	95.8
1984	95.6	96.4	95.3	89.3	99.1	100.3	92.7	93.8	93.5
1985	97.6	97.0	96.5	95.3	100.6	101.1	98.2	98.7	97.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.9	102.5	105.9	104.9	104.3	101.0	102.3	99.1	98.1
1988	112.4	102.3	106.2	111.6	109.8	105.8	109.1	105.1	99.3
1989	108.8	103.4	106.6	118.6	105.3	102.1	114.7	111.2	109.0
1990	107.5	105.5	108.0	125.7	101.9	99.5	119.1	116.3	116.9
1991	104.9	104.4	105.6	130.1	100.5	99.3	124.5	123.1	124.0

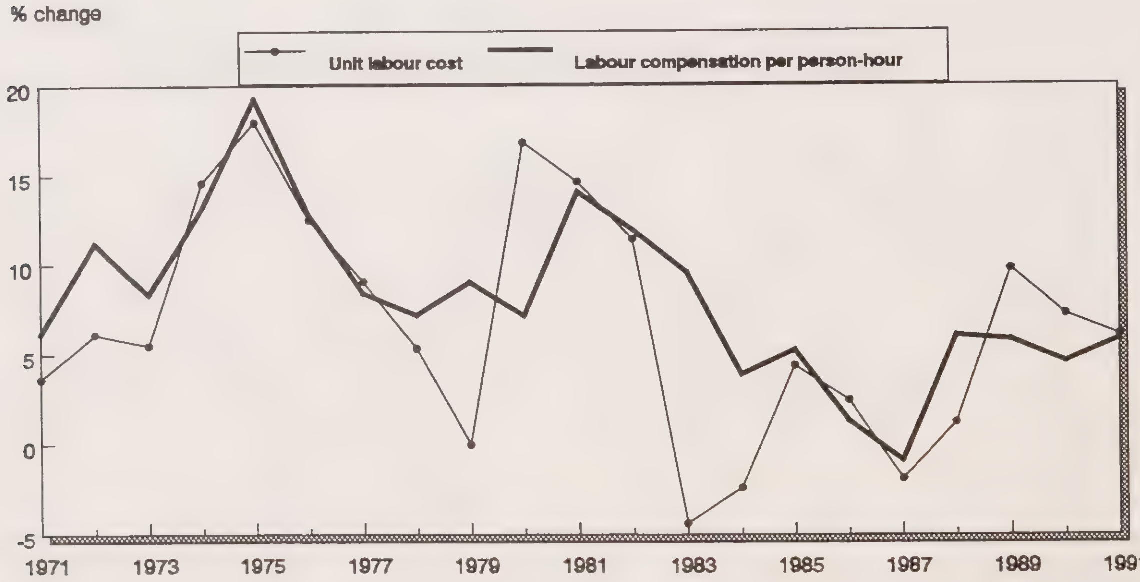


Table 9 - Indices of labour productivity and unit labour cost, communication industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	32.8	73.0	75.2	17.0	44.9	43.6	23.2	22.6	51.7
1972	35.8	75.4	76.8	19.1	47.5	46.6	25.3	24.9	53.3
1973	39.8	80.5	82.2	22.5	49.4	48.4	28.0	27.4	56.6
1974	44.9	86.4	88.0	26.8	51.9	51.0	31.0	30.5	59.8
1975	50.6	86.6	86.7	31.5	58.4	58.4	36.4	36.4	62.3
1976	55.7	93.2	93.1	38.2	59.8	59.8	41.0	41.0	68.6
1977	59.1	96.3	95.3	44.6	61.4	62.0	46.4	46.8	75.5
1978	64.8	95.0	95.5	49.1	68.3	67.9	51.7	51.4	75.7
1979	71.2	96.7	96.6	55.5	73.6	73.7	57.4	57.5	78.0
1980	77.9	99.3	99.8	62.4	78.4	78.1	62.9	62.6	80.2
1981	84.0	102.0	101.0	73.4	82.3	83.2	72.0	72.7	87.4
1982	83.9	103.8	101.7	81.5	80.9	82.5	78.5	80.1	97.1
1983	86.1	102.3	99.0	86.3	84.1	86.9	84.3	87.2	100.3
1984	90.2	101.4	100.2	93.6	88.9	90.0	92.2	93.3	103.7
1985	95.4	101.3	100.7	98.4	94.1	94.8	97.1	97.8	103.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.7	102.7	102.1	106.2	103.9	104.5	103.4	104.0	99.5
1988	114.9	103.7	103.2	110.1	110.8	111.4	106.2	106.7	95.8
1989	127.5	104.7	103.9	116.6	121.8	122.7	111.4	112.3	91.5
1990	137.5	107.1	106.6	125.5	128.3	128.9	117.1	117.7	91.3
1991	143.0	105.5	105.0	130.5	135.6	136.2	123.7	124.3	91.2

Table 10 - Indices of labour productivity and unit labour cost, wholesale and retail trade industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	57.3	64.2	69.0	20.2	89.2	83.1	31.5	29.3	35.3
1972	61.5	67.6	72.3	22.7	91.0	85.1	33.6	31.4	36.9
1973	65.1	71.4	76.3	25.7	91.2	85.3	36.0	33.6	39.5
1974	67.0	75.5	79.9	30.7	88.7	83.9	40.6	38.4	45.8
1975	69.8	77.8	81.6	36.7	89.7	85.6	47.2	45.1	52.6
1976	74.0	78.7	81.6	41.7	94.0	90.7	53.0	51.2	56.4
1977	73.5	80.2	82.2	45.6	91.6	89.4	56.8	55.5	62.0
1978	74.9	84.1	86.0	49.0	89.1	87.1	58.2	56.9	65.3
1979	77.0	86.8	88.3	55.6	88.8	87.2	64.0	62.9	72.1
1980	78.8	88.5	89.7	62.2	89.0	87.9	70.3	69.4	79.0
1981	81.4	93.0	93.7	70.4	87.5	86.8	75.7	75.1	86.5
1982	76.8	90.0	89.0	74.2	85.3	86.3	82.5	83.4	96.7
1983	82.1	89.1	87.1	77.4	92.1	94.2	86.8	88.8	94.3
1984	87.6	94.1	92.9	85.7	93.1	94.3	91.0	92.2	97.8
1985	95.0	98.1	97.3	93.2	96.9	97.7	95.0	95.8	98.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.7	102.3	102.1	109.6	104.3	104.5	107.1	107.4	102.7
1988	112.1	105.3	104.9	120.7	106.4	106.8	114.6	115.0	107.6
1989	114.7	108.2	107.1	130.4	106.1	107.1	120.6	121.8	113.7
1990	112.5	108.7	108.0	136.7	103.5	104.2	125.8	126.6	121.5
1991	110.8	107.1	104.6	139.9	103.5	106.0	130.7	133.8	126.3

Table 11 - Indices of labour productivity and unit labour cost, community, business, personal services industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	43.9	42.3	46.2	15.4	103.8	94.9	36.5	33.4	35.1
1972	47.4	45.3	49.0	17.4	104.7	96.6	38.4	35.5	36.7
1973	52.7	49.0	53.3	20.4	107.7	98.9	41.7	38.3	38.8
1974	57.2	53.0	57.1	24.4	108.0	100.2	46.0	42.7	42.6
1975	59.9	56.1	60.5	27.6	106.8	99.0	49.1	45.5	46.0
1976	64.6	58.6	62.8	33.0	110.1	102.8	56.3	52.6	51.1
1977	66.3	62.4	65.0	36.3	106.2	102.0	58.1	55.8	54.7
1978	70.9	65.9	69.7	40.4	107.6	101.7	61.3	57.9	56.9
1979	73.6	70.7	73.9	45.6	104.0	99.5	64.5	61.7	62.0
1980	81.0	75.4	78.0	54.2	107.3	103.8	71.8	69.5	66.9
1981	87.6	80.2	82.5	62.8	109.2	106.2	78.2	76.1	71.7
1982	86.3	82.9	83.5	70.1	104.1	103.4	84.5	83.9	81.1
1983	85.1	86.6	86.4	74.3	98.3	98.5	85.7	85.9	87.2
1984	90.1	88.6	88.7	82.1	101.7	101.6	92.7	92.6	91.1
1985	93.6	97.0	97.4	91.7	96.5	96.1	94.5	94.2	98.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.7	105.2	106.3	113.0	100.5	99.4	107.4	106.3	106.9
1988	113.7	111.1	113.1	127.4	102.3	100.5	114.7	112.6	112.1
1989	119.1	115.2	116.1	141.4	103.3	102.6	122.7	121.8	118.7
1990	121.3	119.5	120.6	154.3	101.5	100.6	129.1	128.0	127.3
1991	117.1	119.5	118.8	162.2	98.0	98.6	135.7	136.5	138.5

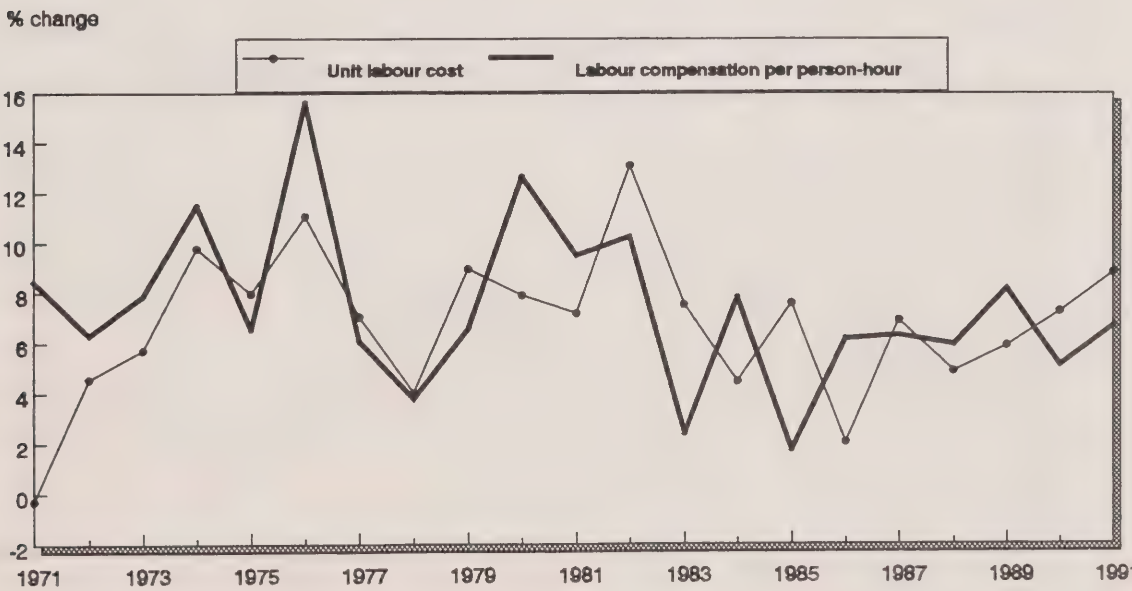


Table 12 - Indices of labour productivity and unit labour cost, food industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	78.0	96.1	101.3	24.9	81.1	77.0	25.9	24.6	31.9
1972	79.3	97.6	101.5	27.1	81.2	78.1	27.8	26.7	34.2
1973	83.0	98.4	101.8	29.5	84.3	81.5	30.0	29.0	35.6
1974	82.2	96.9	100.2	33.8	84.8	82.0	34.8	33.7	41.1
1975	76.3	96.6	100.2	39.4	79.0	76.2	40.8	39.4	51.6
1976	84.6	96.4	99.9	44.9	87.8	84.7	46.6	45.0	53.1
1977	89.3	98.0	100.6	49.6	91.2	88.8	50.7	49.3	55.6
1978	90.6	100.1	102.6	54.4	90.5	88.3	54.3	53.0	60.0
1979	93.7	101.1	103.4	60.5	92.7	90.7	59.8	58.5	64.5
1980	91.3	102.4	103.5	67.2	89.1	88.1	65.6	64.9	73.6
1981	92.0	101.1	101.1	75.9	90.9	91.0	75.0	75.1	82.5
1982	91.9	98.2	97.5	80.7	93.6	94.3	82.2	82.8	87.8
1983	90.3	95.9	97.4	84.9	94.2	92.7	88.5	87.2	94.0
1984	94.4	96.0	97.9	88.4	98.3	96.4	92.1	90.4	93.7
1985	100.6	98.6	99.0	93.8	102.1	101.6	95.2	94.7	93.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.7	101.1	102.2	106.1	99.6	98.6	104.9	103.9	105.3
1988	100.3	102.7	104.6	113.4	97.7	95.8	110.4	108.4	113.1
1989	97.9	103.6	104.4	118.2	94.5	93.8	114.0	113.2	120.7

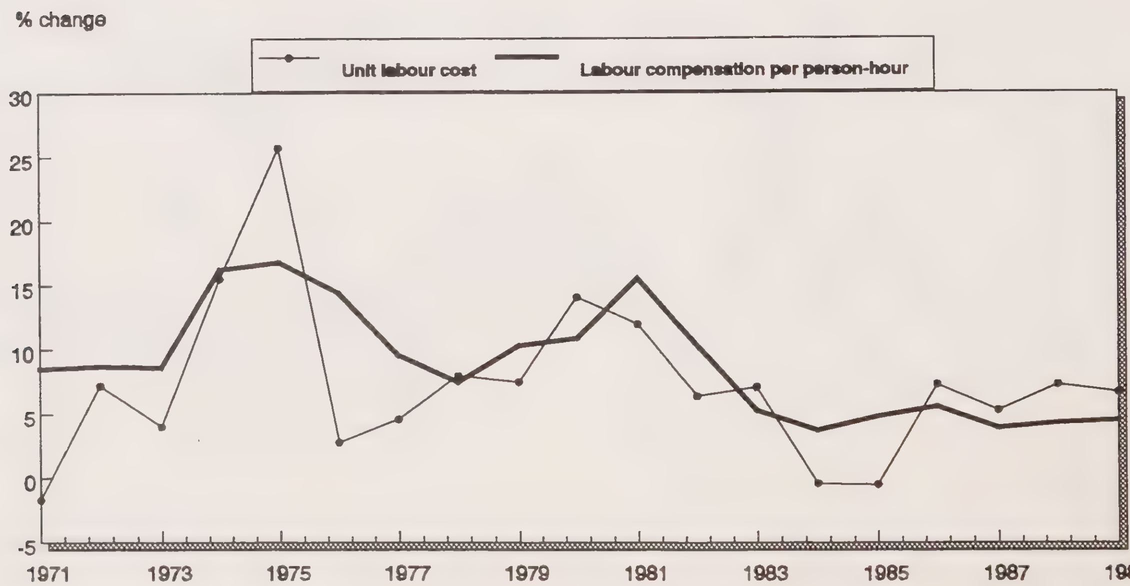


Table 13 - Indices of labour productivity and unit labour cost, beverage industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	106.0	97.4	103.0	23.5	108.8	103.0	24.1	22.8	22.2
1972	109.5	97.1	101.3	25.3	112.8	108.2	26.1	25.0	23.1
1973	119.6	99.1	102.8	28.1	120.7	116.4	28.4	27.4	23.5
1974	121.0	102.7	106.5	33.1	117.9	113.7	32.2	31.0	27.3
1975	116.3	103.0	107.2	38.4	112.9	108.5	37.3	35.9	33.1
1976	112.7	103.3	107.3	44.2	109.1	105.0	42.8	41.2	39.3
1977	118.3	104.4	107.5	48.9	113.3	110.1	46.9	45.5	41.4
1978	115.7	103.2	106.0	52.0	112.2	109.2	50.4	49.1	45.0
1979	118.3	105.0	107.6	58.4	112.7	109.9	55.6	54.2	49.3
1980	114.0	102.0	103.4	64.0	111.7	110.2	62.8	61.9	56.2
1981	113.4	103.1	103.3	72.0	110.0	109.8	69.8	69.7	63.5
1982	103.3	100.6	100.1	78.5	102.7	103.2	78.0	78.4	76.0
1983	99.3	98.7	98.9	84.2	100.6	100.4	85.3	85.1	84.8
1984	103.8	99.9	97.5	89.7	103.9	106.5	89.8	92.0	86.4
1985	105.4	100.6	100.9	94.8	104.9	104.5	94.2	93.9	89.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.7	98.8	100.1	103.7	102.9	101.5	104.9	103.6	102.0
1988	105.1	99.2	102.1	106.8	105.9	102.9	107.6	104.6	101.6
1989	103.8	87.4	86.2	99.9	118.8	120.4	114.4	115.9	96.2

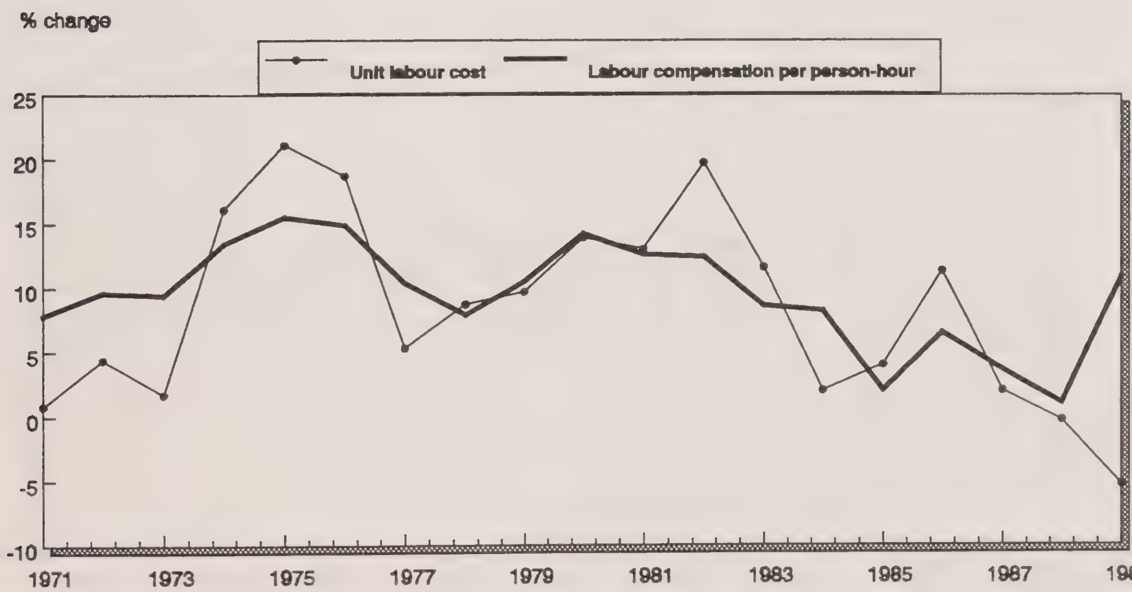


Table 14 - Indices of labour productivity and unit labour cost, tobacco products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	131.1	137.1	154.5	28.5	95.6	84.8	20.7	18.4	21.7
1972	138.8	135.5	151.3	30.4	102.5	91.7	22.5	20.1	21.9
1973	142.1	133.7	146.7	32.6	106.3	96.9	24.4	22.2	22.9
1974	152.9	136.5	147.6	36.4	112.0	103.6	26.7	24.7	23.8
1975	154.4	138.2	151.0	43.9	111.7	102.2	31.8	29.1	28.5
1976	146.8	129.7	142.1	47.2	113.2	103.3	36.4	33.2	32.1
1977	168.4	127.4	136.0	52.2	132.2	123.9	41.0	38.4	31.0
1978	142.6	124.8	133.7	53.8	114.3	106.7	43.2	40.3	37.8
1979	147.5	123.7	133.0	58.3	119.2	110.9	47.2	43.9	39.6
1980	149.6	120.8	127.2	63.9	123.8	117.6	52.9	50.3	42.7
1981	153.4	124.2	132.5	77.4	123.5	115.7	62.3	58.4	50.4
1982	149.6	123.7	128.7	84.0	121.0	116.2	67.9	65.3	56.1
1983	135.2	115.0	120.0	89.2	117.6	112.6	77.6	74.3	66.0
1984	128.3	109.1	113.3	91.9	117.6	113.2	84.2	81.1	71.6
1985	105.9	101.5	107.6	96.2	104.3	98.4	94.7	89.4	90.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.5	85.1	87.5	94.8	125.1	121.6	111.4	108.3	89.1
1988	108.6	78.7	81.3	89.6	138.0	133.5	113.9	110.2	82.5
1989	100.8	73.7	75.1	92.3	136.7	134.3	125.1	122.9	91.6

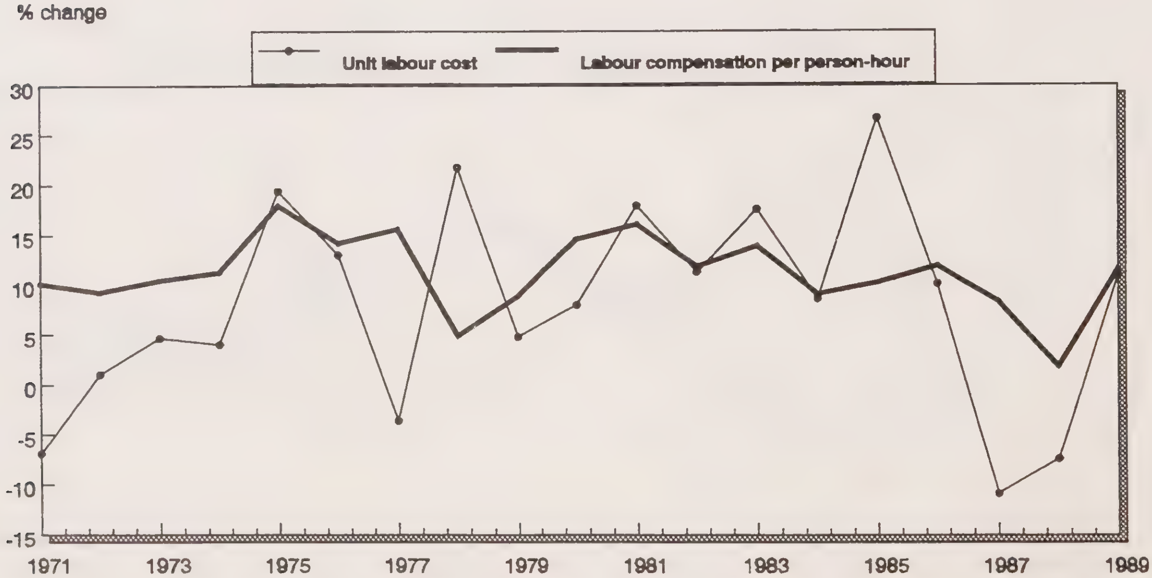


Table 15 - Indices of labour productivity and unit labour cost, rubber products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1971	58.3	80.2	83.5	21.0	72.7	69.8	26.2	25.2	36.0
1972	64.2	87.6	91.1	25.0	73.4	70.6	28.6	27.5	38.9
1973	74.5	97.0	100.0	29.2	76.8	74.5	30.1	29.2	39.2
1974	66.9	95.2	96.1	31.2	70.3	69.6	32.8	32.4	46.6
1975	64.0	96.4	97.0	35.9	66.4	66.0	37.3	37.1	56.2
1976	79.3	100.8	102.1	41.9	78.6	77.6	41.6	41.0	52.8
1977	90.9	101.1	102.0	45.9	89.8	89.1	45.4	45.0	50.5
1978	94.6	102.9	104.0	49.9	92.0	91.0	48.6	48.0	52.8
1979	107.6	105.7	109.6	60.1	101.8	98.2	56.9	54.9	55.9
1980	92.7	102.2	103.1	63.4	90.7	90.0	62.0	61.5	68.3
1981	88.0	103.3	105.1	73.5	85.2	83.7	71.2	70.0	83.6
1982	76.7	97.3	98.5	76.4	78.8	77.9	78.5	77.6	99.6
1983	89.6	97.6	99.0	81.4	91.8	90.5	83.4	82.3	90.9
1984	112.9	99.3	100.5	90.6	113.7	112.3	91.2	90.1	80.3
1985	114.5	98.4	99.9	93.4	116.3	114.6	94.8	93.4	81.5
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.7	94.1	94.6	97.0	111.3	110.8	103.1	102.6	92.6
1988	110.0	101.6	103.4	109.1	108.2	106.3	107.4	105.6	99.3
1989	104.4	99.4	101.5	111.0	105.0	102.9	111.7	109.4	106.3

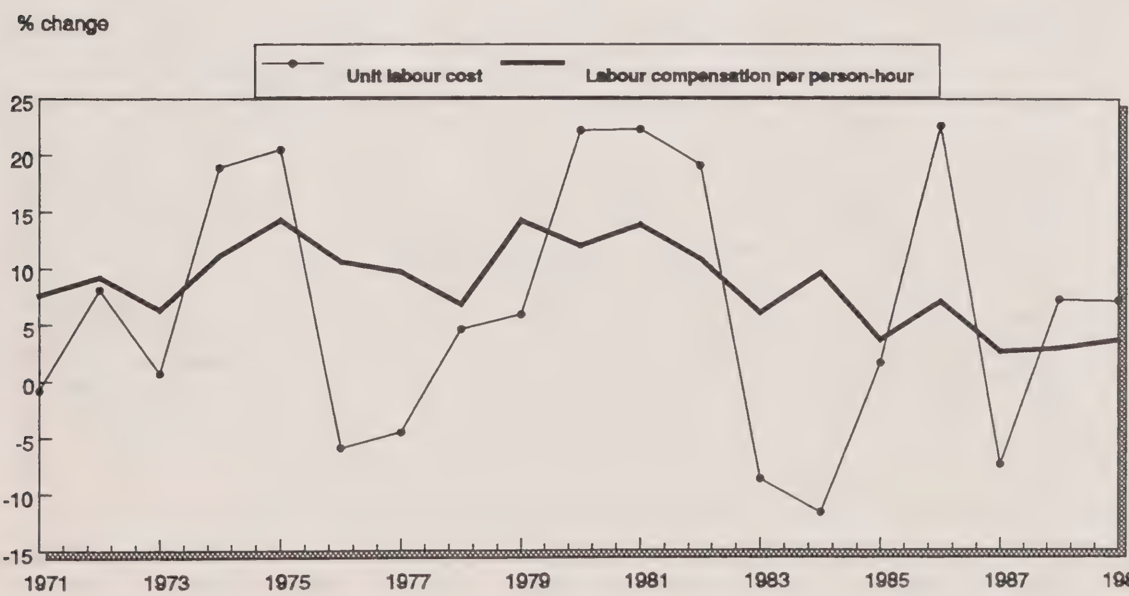


Table 16 - Indices of labour productivity and unit labour cost, plastic products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	36.9	50.4	51.9	13.9	73.3	71.2	27.6	26.9	37.7
1972	46.9	57.5	59.1	17.1	81.4	79.3	29.7	28.9	36.5
1973	54.4	63.9	65.1	20.3	85.1	83.5	31.7	31.2	37.3
1974	52.7	66.7	66.6	24.3	79.0	79.1	36.4	36.5	46.1
1975	47.9	65.5	65.1	26.7	73.1	73.6	40.8	41.0	55.7
1976	53.5	68.7	68.8	32.1	77.9	77.8	46.7	46.6	59.9
1977	56.2	69.6	69.3	35.7	80.7	81.0	51.3	51.5	63.6
1978	63.7	76.1	76.0	42.0	83.7	83.8	55.2	55.2	65.9
1979	73.7	80.0	82.0	48.1	92.1	90.0	60.2	58.7	65.3
1980	73.5	82.4	82.1	54.6	89.2	89.5	66.2	66.5	74.3
1981	75.5	81.6	82.0	61.6	92.5	92.0	75.5	75.1	81.6
1982	68.8	76.4	76.4	62.6	90.1	90.1	82.0	82.0	91.0
1983	78.7	76.3	77.2	67.4	103.1	101.9	88.3	87.3	85.6
1984	90.1	85.4	85.6	77.9	105.5	105.3	91.2	91.1	86.5
1985	99.6	92.3	93.4	89.1	107.9	106.7	96.5	95.4	89.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	112.3	108.0	108.8	111.8	104.0	103.2	103.5	102.7	99.5
1988	115.1	122.2	123.5	133.3	94.2	93.2	109.1	107.9	115.8
1989	117.4	127.6	130.9	144.9	92.0	89.7	113.6	110.7	123.5

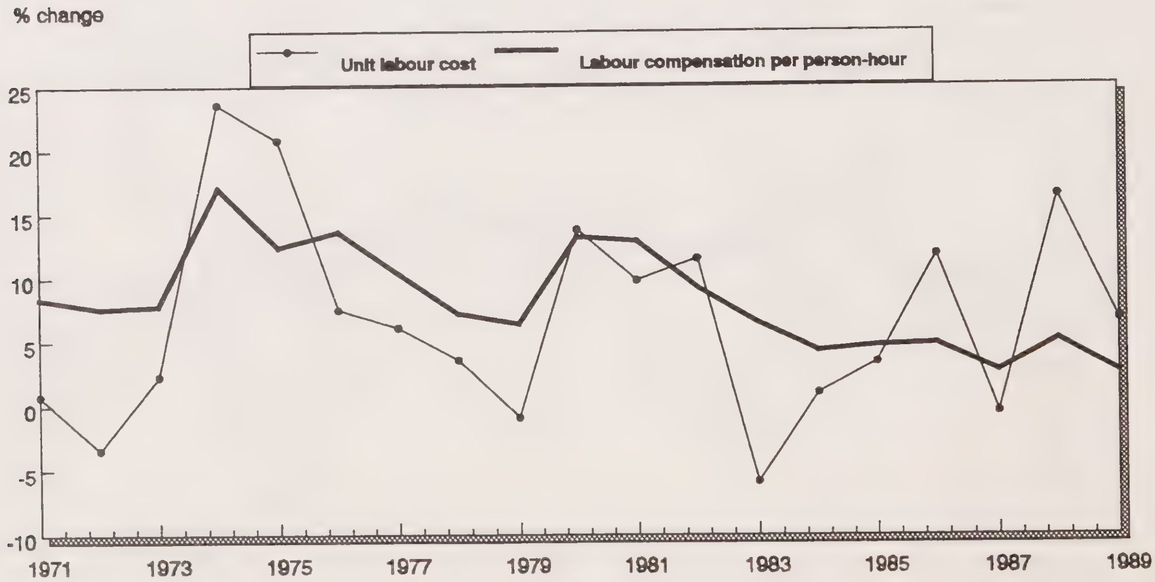


Table 17 - Indices of labour productivity and unit labour cost, leather & allied products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	85.4	127.5	134.7	36.7	67.0	63.4	28.8	27.2	42.9
1972	82.5	124.7	131.8	38.2	66.1	62.6	30.6	29.0	46.3
1973	83.8	124.0	129.2	41.0	67.6	64.8	33.1	31.7	48.9
1974	86.8	121.0	128.2	46.6	71.7	67.7	38.5	36.4	53.7
1975	87.2	121.7	125.2	52.6	71.7	69.7	43.2	42.0	60.3
1976	95.9	120.4	124.9	59.7	79.6	76.8	49.6	47.8	62.3
1977	88.9	107.7	112.0	58.6	82.5	79.3	54.4	52.3	65.9
1978	101.7	110.9	114.5	66.0	91.7	88.8	59.5	57.6	64.9
1979	103.1	115.8	120.4	75.6	89.0	85.6	65.3	62.8	73.4
1980	98.5	113.2	115.9	78.6	87.0	84.9	69.4	67.8	79.8
1981	103.5	117.3	120.1	91.5	88.2	86.2	78.0	76.2	88.4
1982	90.2	101.2	104.6	85.2	89.1	86.2	84.2	81.5	94.5
1983	95.2	101.9	102.5	89.3	93.5	92.9	87.7	87.2	93.8
1984	104.3	104.1	105.6	96.7	100.2	98.7	92.9	91.5	92.7
1985	100.1	98.6	99.9	97.0	101.6	100.2	98.5	97.1	97.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	92.6	92.9	91.1	96.1	99.7	101.6	103.4	105.5	103.8
1988	86.2	86.3	85.5	92.0	99.9	100.9	106.6	107.7	106.7
1989	84.5	79.1	81.9	87.7	106.9	103.3	110.9	107.1	103.7

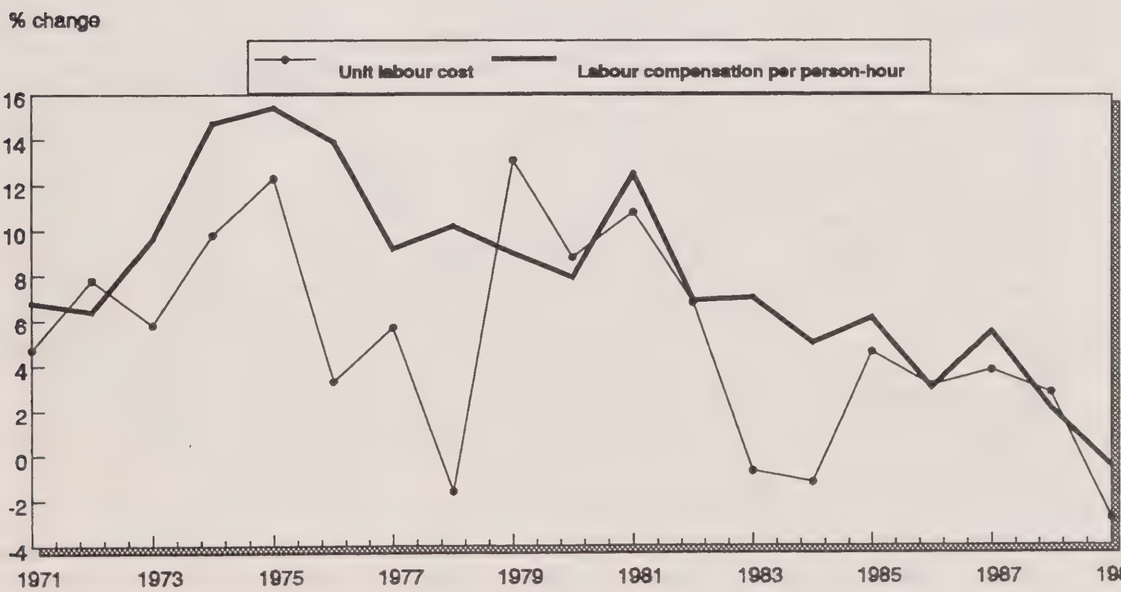


Table 18 - Indices of labour productivity and unit labour cost, primary textile & textile products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	56.6	116.0	121.7	30.9	48.8	46.5	26.6	25.4	54.5
1972	67.0	123.8	129.4	34.9	54.1	51.8	28.2	27.0	52.1
1973	71.4	128.8	133.7	38.7	55.5	53.4	30.1	29.0	54.2
1974	72.1	128.7	132.4	43.9	56.0	54.4	34.1	33.1	60.9
1975	70.8	121.0	123.9	46.3	58.5	57.2	38.2	37.3	65.3
1976	72.0	113.3	115.3	50.4	63.5	62.4	44.5	43.7	70.0
1977	75.8	106.2	107.2	52.6	71.4	70.8	49.5	49.0	69.3
1978	83.4	108.1	109.3	58.3	77.2	76.3	53.9	53.3	69.9
1979	90.6	112.1	113.2	67.0	80.8	80.0	59.8	59.2	74.0
1980	88.1	111.3	111.1	73.5	79.1	79.3	66.0	66.1	83.4
1981	91.8	109.6	110.3	80.9	83.8	83.2	73.8	73.3	88.1
1982	71.2	96.4	97.7	75.7	73.9	72.9	78.5	77.5	106.3
1983	91.6	102.7	103.1	86.8	89.2	88.9	84.5	84.2	94.7
1984	91.1	101.5	101.1	90.3	89.7	90.1	89.0	89.3	99.2
1985	90.4	97.8	96.2	93.9	92.5	94.0	96.1	97.7	103.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.9	102.6	103.0	108.2	100.3	99.9	105.5	105.0	105.2
1988	101.2	104.5	105.4	113.7	96.8	96.0	108.8	107.8	112.3
1989	98.6	100.7	103.8	114.8	97.9	95.0	114.0	110.6	116.4

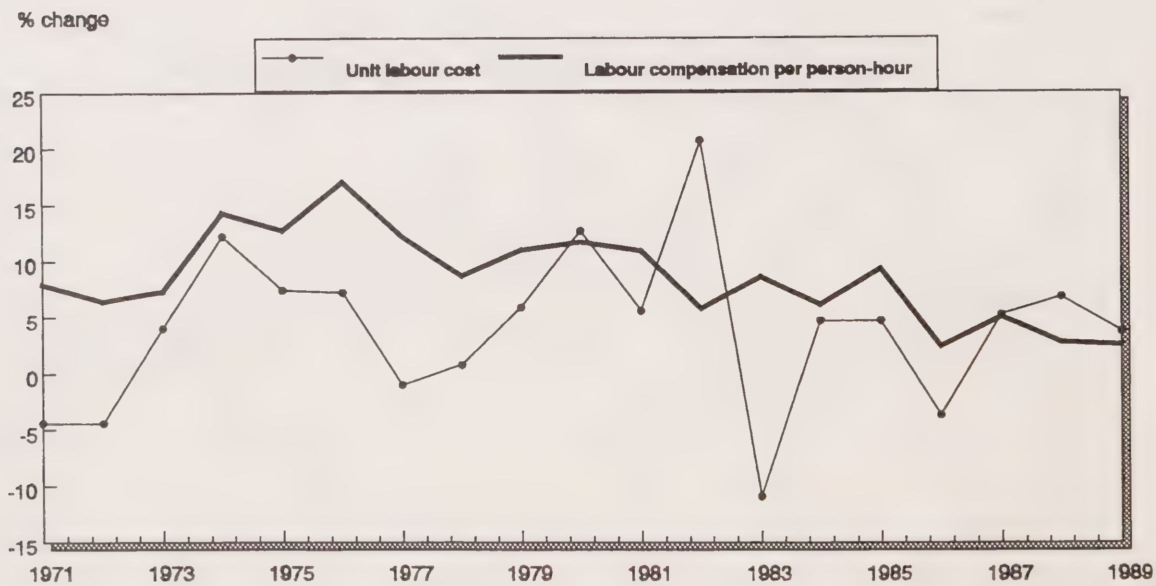


Table 19 - Indices of labour productivity and unit labour cost, clothing industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	68.3	105.7	108.1	31.3	64.7	63.2	29.6	28.9	45.7
1972	73.0	109.4	111.6	34.7	66.8	65.5	31.7	31.1	47.5
1973	78.3	111.7	112.0	38.1	70.1	69.8	34.1	34.0	48.6
1974	78.9	109.0	109.9	42.9	72.4	71.8	39.4	39.0	54.3
1975	81.8	107.9	109.1	49.4	75.8	74.9	45.7	45.2	60.4
1976	87.2	109.4	110.2	56.7	79.7	79.1	51.9	51.5	65.1
1977	85.7	101.9	102.0	58.4	84.2	84.1	57.3	57.2	68.1
1978	92.9	102.6	102.5	64.1	90.6	90.6	62.5	62.5	68.9
1979	99.7	103.8	103.9	71.7	96.1	96.0	69.1	69.0	71.9
1980	94.1	99.9	98.3	75.7	94.1	95.7	75.8	77.1	80.5
1981	96.9	99.7	96.9	82.2	97.3	100.0	82.5	84.8	84.8
1982	86.1	94.0	89.9	80.3	91.6	95.7	85.5	89.3	93.3
1983	86.2	96.6	95.8	85.3	89.2	90.0	88.3	89.1	99.0
1984	92.8	97.3	97.3	90.1	95.4	95.4	92.6	92.6	97.1
1985	95.8	97.5	96.9	93.3	98.2	98.9	95.7	96.3	97.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.6	98.5	102.2	105.9	105.2	101.4	107.5	103.6	102.2
1988	101.4	101.6	103.2	112.8	99.8	98.3	111.0	109.2	111.2
1989	100.2	98.7	99.6	116.8	101.6	100.7	118.4	117.3	116.6

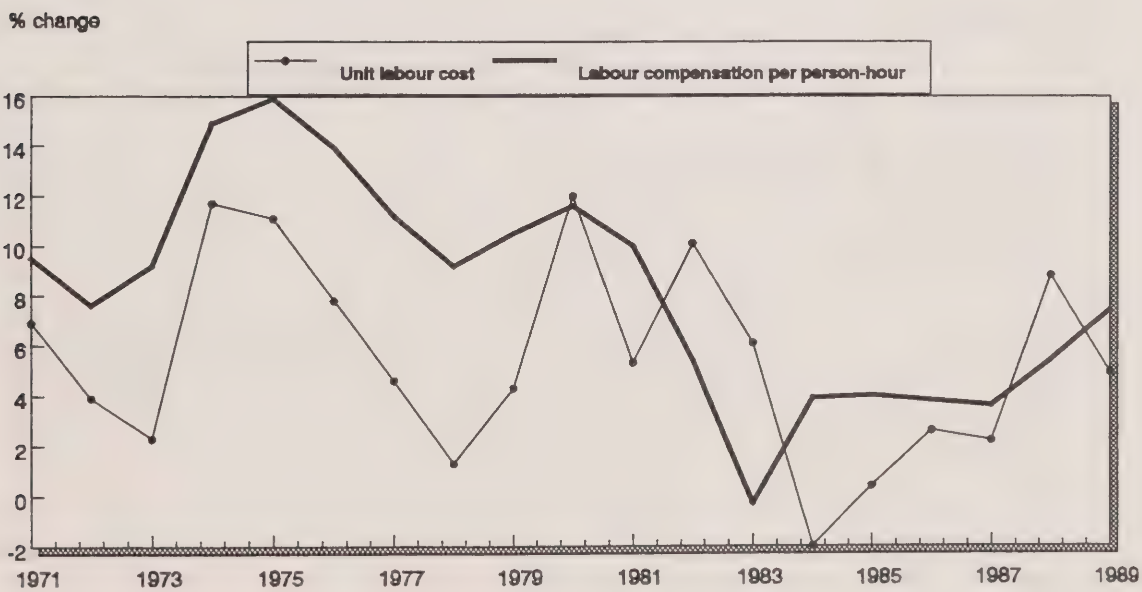


Table 20 - Indices of labour productivity and unit labour cost, wood industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	55.0	83.6	87.8	21.4	65.8	62.6	25.6	24.4	39.0
1972	55.6	93.5	96.8	25.9	59.5	57.5	27.7	26.8	46.6
1973	61.3	101.5	105.0	31.3	60.3	58.4	30.8	29.8	51.1
1974	63.5	97.2	99.4	35.0	65.3	63.9	36.0	35.3	55.1
1975	56.4	89.3	90.9	36.6	63.2	62.1	41.0	40.3	64.9
1976	68.4	97.6	100.1	46.8	70.1	68.4	47.9	46.7	68.3
1977	75.9	100.0	101.8	54.1	75.9	74.6	54.1	53.1	71.2
1978	76.2	107.3	108.5	62.3	71.0	70.2	58.1	57.4	81.7
1979	76.4	110.2	111.5	70.9	69.4	68.5	64.4	63.6	92.8
1980	81.5	106.0	106.4	75.7	76.8	76.6	71.4	71.1	92.9
1981	78.3	101.7	97.0	79.4	77.0	80.7	78.1	81.9	101.4
1982	63.3	87.8	80.2	72.4	72.1	79.0	82.5	90.3	114.4
1983	78.3	92.0	89.0	83.6	85.0	88.0	90.9	94.0	106.9
1984	87.8	92.9	91.8	88.0	94.5	95.6	94.7	95.8	100.2
1985	99.7	97.0	96.8	95.3	102.8	103.0	98.3	98.5	95.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	115.5	109.4	110.0	116.3	105.6	105.0	106.4	105.8	100.8
1988	117.7	111.5	114.2	123.3	105.5	103.1	110.6	108.0	104.8
1989	116.1	111.3	113.7	127.9	104.3	102.1	114.9	112.5	110.2

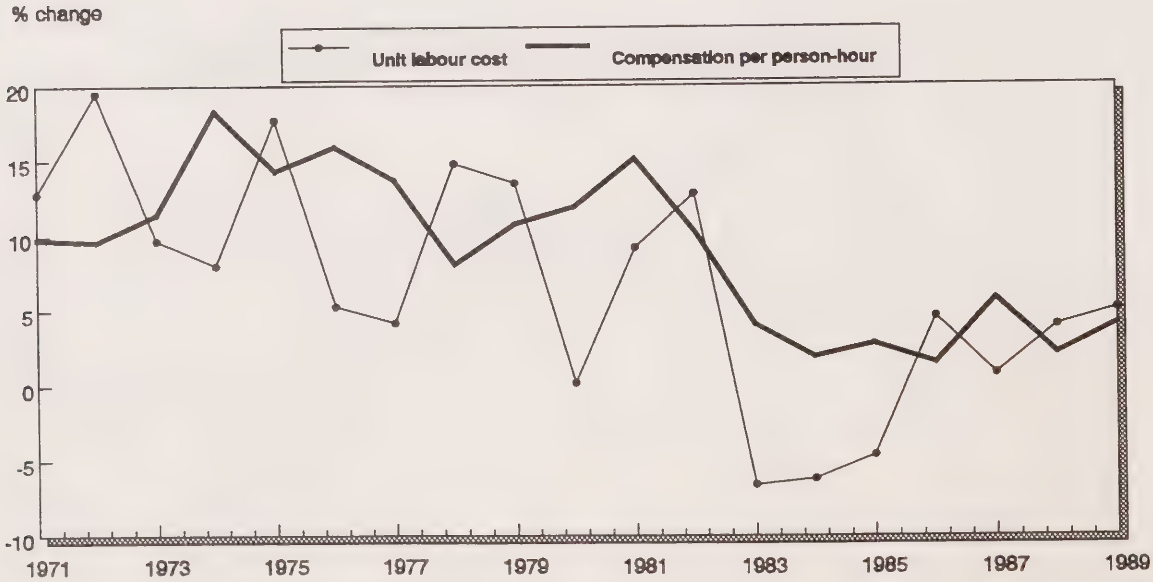


Table 21 - Indices of labour productivity and unit labour cost, furniture & fixture industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	72.3	74.3	77.1	21.3	97.4	93.8	28.7	27.6	29.4
1972	88.2	81.1	84.3	25.2	108.7	104.6	31.0	29.8	28.5
1973	97.3	84.3	87.4	28.3	115.4	111.3	33.6	32.4	29.1
1974	85.2	88.6	92.2	33.8	96.1	92.4	38.2	36.7	39.7
1975	80.6	86.5	89.4	37.1	93.2	90.2	42.9	41.4	46.0
1976	88.2	83.7	87.2	41.7	105.4	101.2	49.8	47.9	47.3
1977	81.9	76.5	79.3	41.6	107.1	103.3	54.4	52.4	50.7
1978	89.7	78.7	81.1	45.8	114.0	110.6	58.2	56.5	51.1
1979	88.5	85.9	89.5	53.0	103.0	98.9	61.7	59.2	59.9
1980	82.3	85.6	87.7	58.4	96.2	93.9	68.2	66.6	70.9
1981	91.7	88.5	90.2	69.8	103.6	101.6	78.8	77.3	76.1
1982	69.9	79.8	80.8	64.9	87.6	86.5	81.4	80.4	92.9
1983	79.0	78.8	77.7	69.4	100.3	101.6	88.2	89.3	87.9
1984	85.0	81.6	81.4	76.0	104.2	104.5	93.1	93.4	89.4
1985	94.7	89.9	89.5	87.1	105.4	105.9	97.0	97.4	92.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.8	110.9	111.4	111.8	90.0	89.5	100.9	100.4	112.1
1988	97.3	112.2	112.6	121.8	86.7	86.4	108.6	108.2	125.3
1989	98.1	114.1	110.0	129.2	86.0	89.2	113.3	117.5	131.7

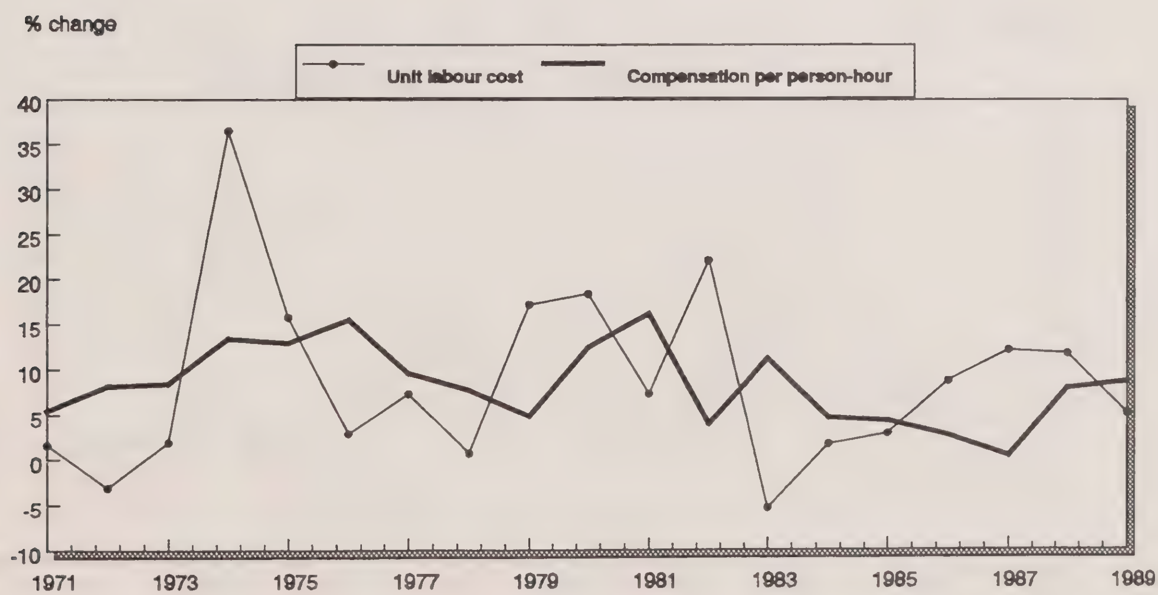


Table 22 - Indices of labour productivity and unit labour cost, paper & allied products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1971	85.3	100.3	104.2	24.2	85.0	81.9	24.1	23.2	28.4
1972	92.8	101.1	105.6	26.4	91.7	87.8	26.1	25.0	28.5
1973	100.3	103.1	106.7	28.8	97.2	94.0	27.9	27.0	28.7
1974	108.6	109.9	113.1	35.6	98.8	96.0	32.4	31.5	32.8
1975	77.3	106.5	99.6	36.6	72.5	77.6	34.3	36.7	47.4
1976	95.3	109.1	107.6	45.9	87.4	88.6	42.1	42.7	48.2
1977	94.2	104.0	106.0	49.3	90.6	88.8	47.5	46.5	52.4
1978	104.1	105.5	113.2	54.3	98.7	91.9	51.4	47.9	52.1
1979	102.8	106.9	108.1	59.3	96.2	95.1	55.4	54.8	57.6
1980	100.7	107.8	115.0	66.1	93.4	87.6	61.3	57.4	65.6
1981	96.7	107.6	108.1	75.4	89.9	89.5	70.1	69.8	78.0
1982	82.9	100.5	100.2	78.0	82.5	82.7	77.7	77.9	94.2
1983	92.8	97.6	97.7	82.1	95.0	94.9	84.1	84.0	88.5
1984	96.1	98.9	99.2	86.6	97.2	96.9	87.6	87.3	90.1
1985	94.9	97.5	97.9	92.8	97.3	96.9	95.1	94.8	97.7
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.0	102.0	101.7	105.4	104.0	104.3	103.4	103.7	99.4
1988	106.4	103.1	103.8	112.0	103.2	102.5	108.6	107.9	105.3
1989	103.0	101.8	102.8	116.5	101.1	100.1	114.4	113.2	113.1

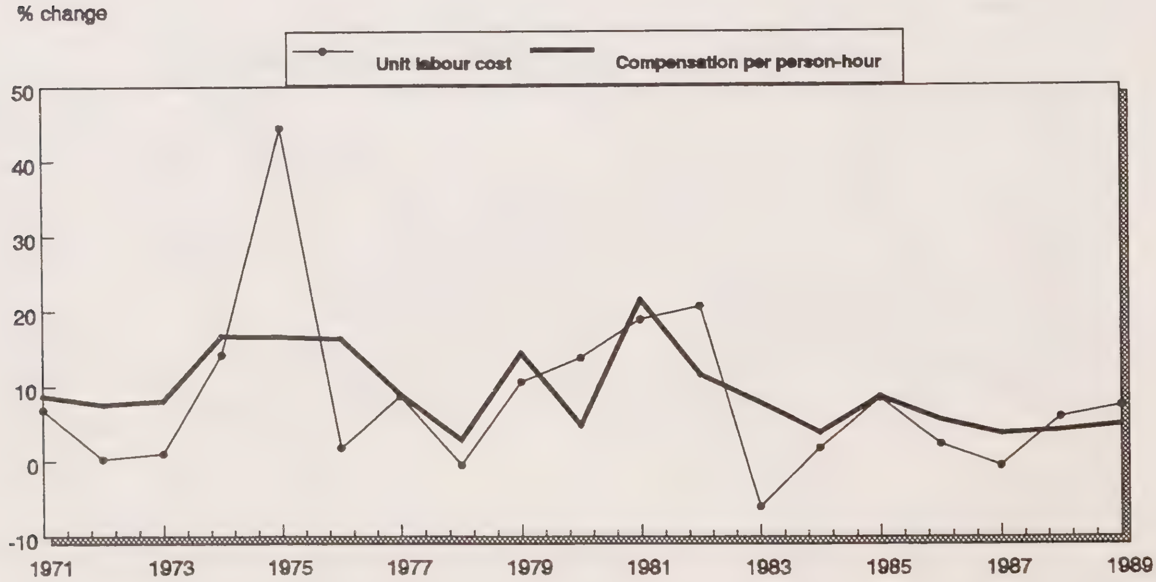


Table 23 - Indices of labour productivity and unit labour cost, printing, publishing & allied industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compen-sation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compen-sation per person	Compen-sation per person-hour	Unit labour cost
1971	54.6	71.9	76.2	19.6	75.9	71.7	27.2	25.7	35.8
1972	58.8	73.3	77.5	21.5	80.2	75.9	29.3	27.7	36.5
1973	65.0	77.4	80.9	24.2	84.0	80.4	31.3	30.0	37.3
1974	65.5	78.4	81.3	27.9	83.5	80.5	35.6	34.3	42.6
1975	66.4	78.7	81.2	31.6	84.3	81.7	40.1	38.9	47.6
1976	72.9	79.3	81.1	35.9	92.0	89.9	45.3	44.2	49.2
1977	76.5	78.1	79.3	38.7	97.9	96.4	49.5	48.7	50.6
1978	82.3	81.7	83.7	43.2	100.7	98.4	52.8	51.6	52.5
1979	84.1	85.4	86.6	48.7	98.4	97.1	57.0	56.2	57.9
1980	88.8	89.3	91.6	56.2	99.4	96.9	62.9	61.4	63.3
1981	91.0	89.7	90.2	64.2	101.3	100.8	71.6	71.2	70.6
1982	83.4	89.4	90.1	69.2	93.2	92.5	77.4	76.8	83.0
1983	86.3	89.3	89.1	75.5	96.6	96.8	84.5	84.7	87.5
1984	93.2	92.1	92.5	82.1	101.2	100.7	89.2	88.8	88.2
1985	97.6	95.0	95.0	90.3	102.7	102.8	95.0	95.1	92.5
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.8	103.4	103.7	107.2	96.5	96.2	103.6	103.3	107.4
1988	104.6	108.2	109.5	121.2	96.6	95.5	111.9	110.7	115.9
1989	105.2	114.1	115.2	134.1	92.3	91.4	117.6	116.4	127.4

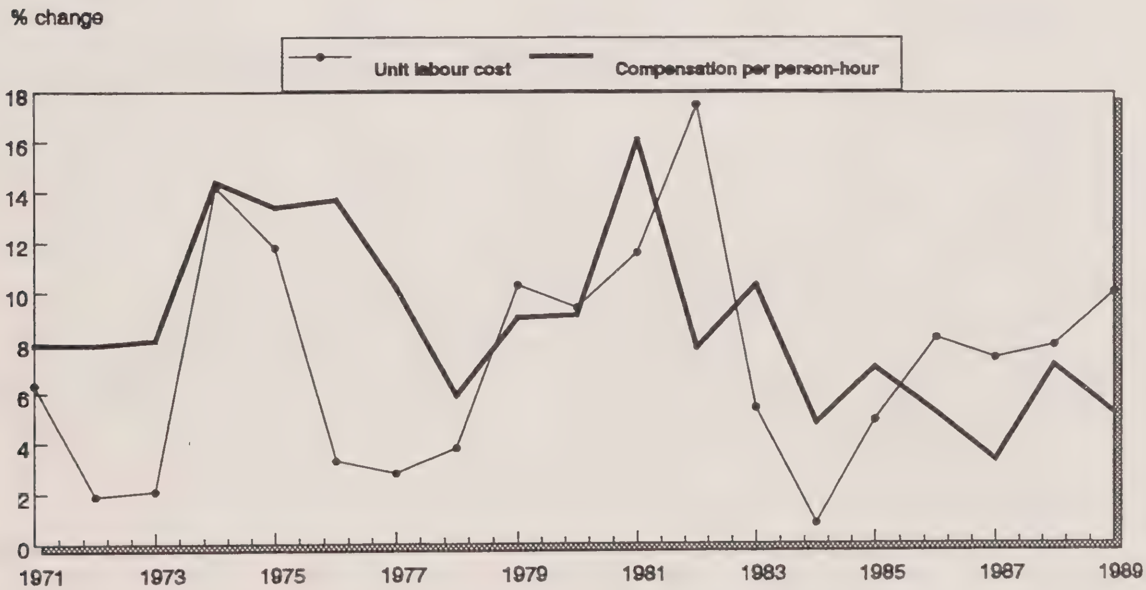


Table 24 - Indices of labour productivity and unit labour cost, primary metal industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	86.5	110.5	114.9	25.6	78.3	75.3	23.1	22.3	29.6
1972	91.4	110.0	115.4	27.8	83.1	79.2	25.3	24.1	30.4
1973	100.3	112.9	118.9	31.0	88.8	84.3	27.4	26.0	30.9
1974	107.6	118.4	124.9	36.9	90.9	86.1	31.1	29.5	34.3
1975	98.0	116.6	118.1	41.4	84.1	83.0	35.5	35.0	42.2
1976	90.2	113.7	115.0	45.4	79.3	78.4	39.9	39.5	50.3
1977	98.9	115.5	117.4	50.5	85.6	84.2	43.7	43.0	51.0
1978	104.1	118.3	120.6	55.9	88.0	86.3	47.3	46.4	53.7
1979	94.8	122.9	126.8	63.7	77.2	74.8	51.8	50.2	67.2
1980	87.3	124.5	128.4	72.2	70.1	67.9	58.0	56.2	82.7
1981	94.5	120.9	122.7	81.2	78.2	77.0	67.2	66.2	85.9
1982	71.0	109.8	110.0	84.1	64.7	64.5	76.6	76.4	118.4
1983	80.1	102.5	102.5	85.0	78.2	78.2	82.9	82.9	106.1
1984	98.0	105.3	109.4	95.6	93.1	89.5	90.8	87.3	97.5
1985	103.7	103.2	102.6	98.9	100.5	101.1	95.9	96.5	95.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	110.5	100.7	101.0	104.6	109.8	109.4	103.8	103.6	94.6
1988	116.4	105.1	107.4	114.3	110.7	108.4	108.7	106.5	98.2
1989	113.9	102.5	102.4	118.1	111.2	111.2	115.3	115.3	103.7

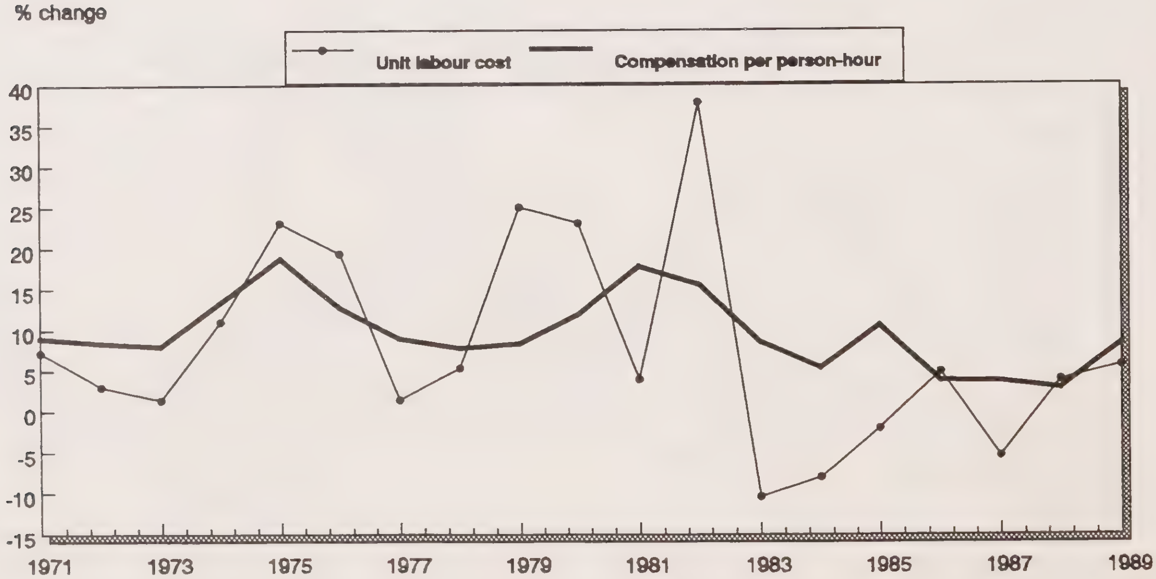


Table 25 - Indices of labour productivity and unit labour cost, fabricated metal products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1971	81.1	93.9	97.4	27.9	86.3	83.2	29.7	28.7	34.4
1972	85.1	95.2	98.7	30.4	89.5	86.3	32.0	30.8	35.7
1973	92.5	99.9	102.9	34.5	92.6	89.9	34.6	33.5	37.3
1974	100.4	106.1	107.8	41.7	94.6	93.1	39.3	38.7	41.5
1975	91.4	104.7	106.2	46.7	87.3	86.1	44.6	44.0	51.1
1976	97.6	106.1	107.5	53.1	92.0	90.8	50.0	49.4	54.4
1977	95.9	103.1	104.5	56.4	93.0	91.7	54.7	53.9	58.8
1978	99.0	105.8	108.0	61.9	93.6	91.7	58.5	57.3	62.5
1979	102.3	110.4	110.9	70.4	92.6	92.2	63.8	63.5	68.9
1980	102.4	109.0	109.6	76.7	93.9	93.5	70.3	70.0	74.9
1981	100.6	106.1	106.4	84.3	94.8	94.6	79.4	79.2	83.8
1982	85.5	94.2	93.1	82.2	90.8	91.8	87.2	88.2	96.1
1983	80.7	87.6	86.0	81.2	92.1	93.8	92.7	94.4	100.6
1984	86.9	87.4	86.8	83.9	99.4	100.0	96.0	96.7	96.6
1985	97.6	94.5	95.1	93.3	103.3	102.7	98.8	98.2	95.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.9	106.5	106.8	108.2	99.5	99.1	101.6	101.3	102.1
1988	108.3	114.0	115.0	122.7	95.0	94.1	107.6	106.7	113.3
1989	111.6	121.8	122.7	137.1	91.7	91.0	112.6	111.7	122.8

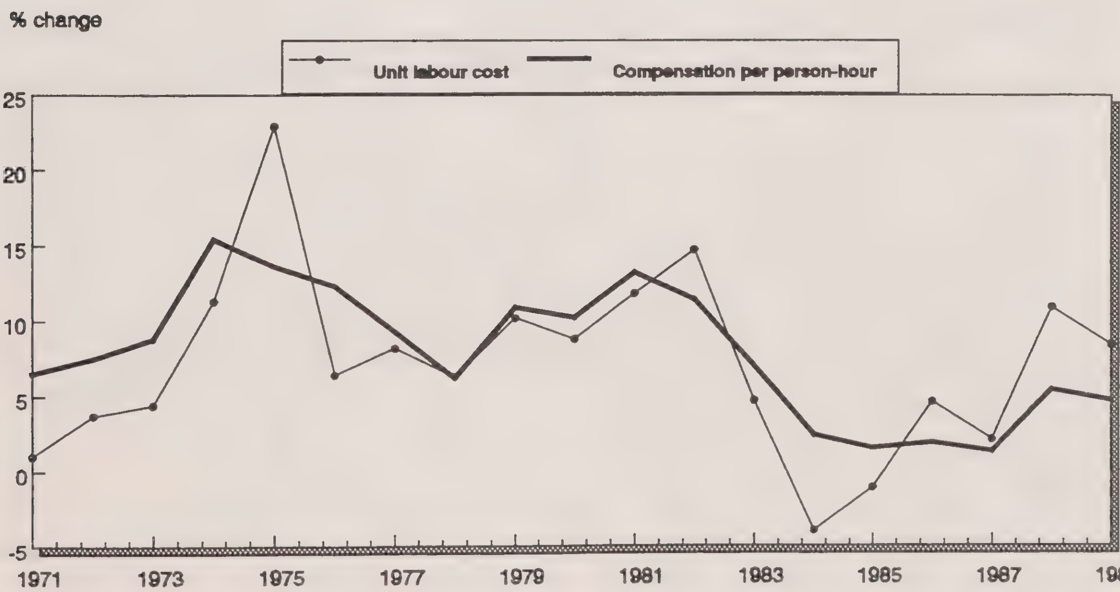


Table 26 - Indices of labour productivity and unit labour cost, machinery industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	71.4	80.5	82.6	23.6	88.8	86.5	29.3	28.6	33.0
1972	77.5	87.2	89.4	27.2	88.9	86.8	31.2	30.4	35.1
1973	85.0	91.8	93.5	30.6	92.6	90.9	33.3	32.7	36.0
1974	96.7	100.9	101.6	38.1	95.8	95.1	37.8	37.5	39.4
1975	96.2	107.7	108.0	45.3	89.4	89.0	42.1	41.9	47.1
1976	97.2	104.0	104.4	49.1	93.4	93.1	47.2	47.0	50.5
1977	99.5	103.5	102.3	53.7	96.2	97.3	51.9	52.5	54.0
1978	105.0	105.7	105.9	59.8	99.3	99.1	56.6	56.5	57.0
1979	120.6	114.7	114.4	71.2	105.1	105.4	62.1	62.2	59.0
1980	122.4	121.4	120.5	83.2	100.8	101.6	68.5	69.0	68.0
1981	118.4	118.7	116.9	93.5	99.7	101.3	78.7	80.0	78.9
1982	88.2	100.4	98.1	86.2	87.9	89.9	85.9	87.9	97.8
1983	78.0	89.1	87.4	78.7	87.6	89.3	88.4	90.1	100.9
1984	94.5	93.1	92.7	86.3	101.5	102.0	92.8	93.2	91.4
1985	96.5	95.5	95.2	92.3	101.0	101.3	96.6	96.9	95.7
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	98.0	105.5	106.7	106.5	92.9	91.9	101.0	99.9	108.7
1988	109.4	116.7	116.8	122.9	93.8	93.7	105.3	105.2	112.3
1989	111.7	121.1	121.2	134.0	92.3	92.2	110.7	110.6	119.9

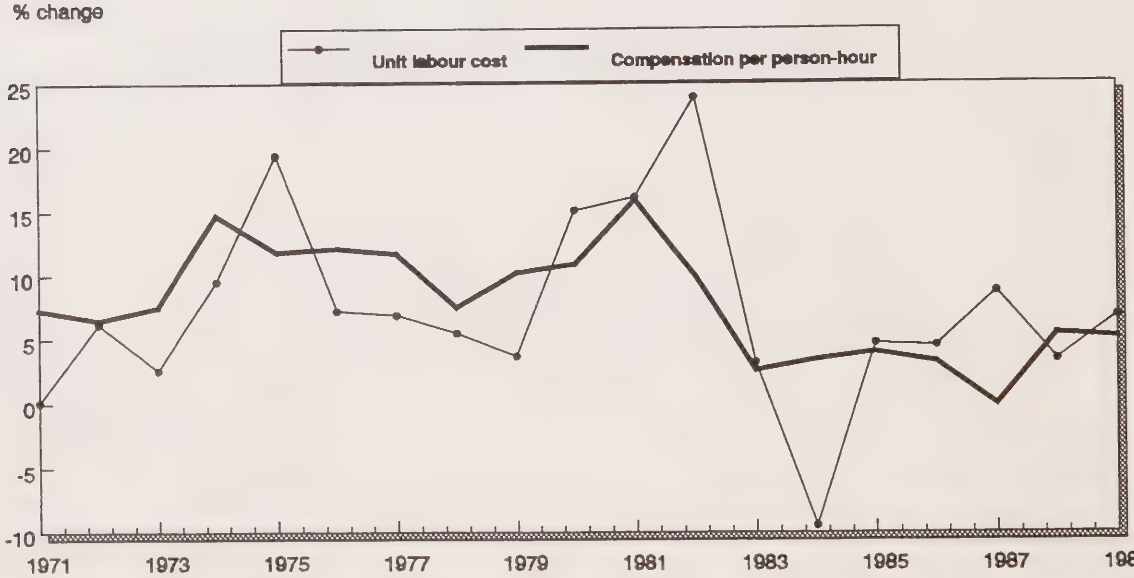


Table 27 - Indices of labour productivity and unit labour cost, transportation equipment industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1971	52.6	74.1	71.9	19.4	71.0	73.2	26.2	27.0	36.9
1972	59.9	78.3	77.4	22.1	76.5	77.5	28.2	28.6	36.9
1973	70.5	86.2	85.2	26.1	81.8	82.8	30.3	30.6	37.0
1974	70.7	85.0	82.6	28.8	83.2	85.7	33.9	34.9	40.8
1975	72.4	79.1	77.1	30.1	91.6	94.0	38.1	39.1	41.6
1976	78.4	82.0	79.0	35.7	95.6	99.1	43.5	45.1	45.5
1977	81.5	83.0	81.5	40.4	98.3	100.0	48.7	49.6	49.5
1978	84.2	88.6	84.8	46.7	95.0	99.3	52.7	55.0	55.4
1979	84.3	93.7	87.6	52.3	90.0	96.3	55.9	59.8	62.1
1980	65.3	87.9	81.6	53.4	74.2	80.0	60.8	65.4	81.8
1981	72.0	87.9	82.3	62.3	81.9	87.5	70.9	75.7	86.5
1982	66.0	80.2	73.9	61.0	82.3	89.3	76.1	82.6	92.5
1983	75.7	80.9	77.2	67.5	93.6	98.1	83.5	87.5	89.2
1984	95.9	91.3	89.9	82.7	105.0	106.7	90.6	92.0	86.2
1985	102.6	98.4	97.4	94.6	104.2	105.3	96.1	97.2	92.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.6	101.9	103.2	105.5	97.7	96.4	103.6	102.2	106.0
1988	118.1	108.6	108.9	117.0	108.8	108.4	107.8	107.4	99.1
1989	123.5	112.4	108.8	125.1	109.9	113.5	111.3	115.0	101.3

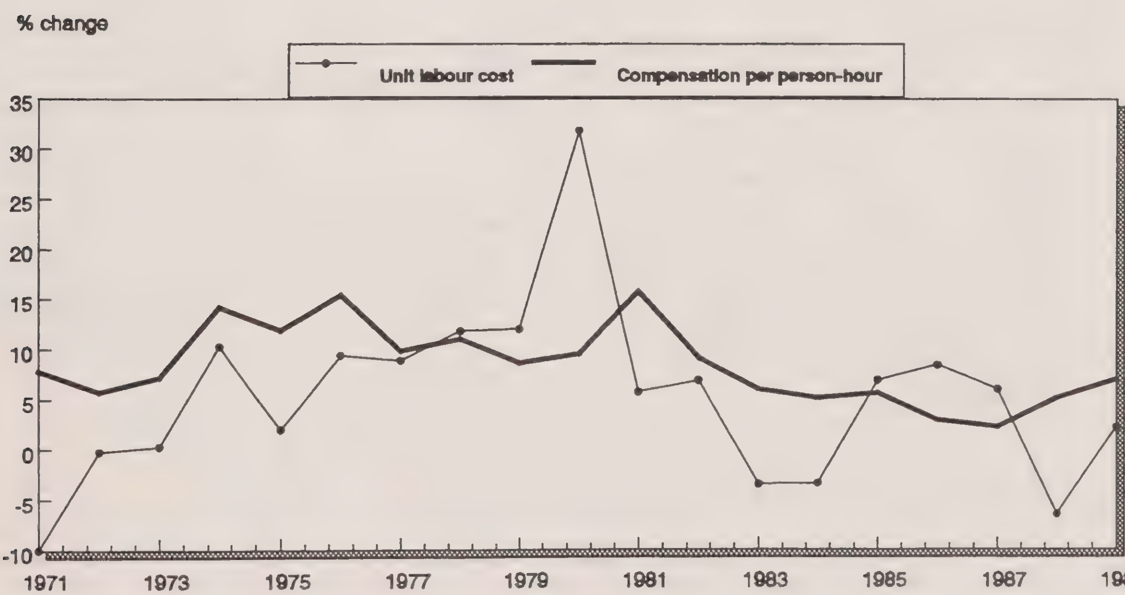


Table 28 - Indices of labour productivity and unit labour cost, electrical & electronic products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	36.9	98.9	101.0	25.9	37.3	36.6	26.1	25.6	70.0
1972	41.5	98.8	101.3	27.5	42.0	40.9	27.9	27.2	66.4
1973	47.5	104.6	107.5	31.0	45.4	44.2	29.6	28.8	65.2
1974	49.4	109.1	111.5	36.7	45.3	44.3	33.6	32.9	74.3
1975	44.6	102.4	104.1	39.3	43.5	42.8	38.4	37.7	88.1
1976	47.4	99.4	100.2	43.1	47.7	47.3	43.3	43.0	90.8
1977	47.5	90.8	91.3	43.3	52.3	52.0	47.6	47.4	91.1
1978	47.7	92.9	94.1	47.6	51.3	50.6	51.3	50.6	99.9
1979	57.4	98.6	99.3	56.5	58.3	57.9	57.3	56.9	98.4
1980	64.2	101.9	101.9	63.9	63.0	63.0	62.7	62.7	99.6
1981	72.2	107.7	107.6	75.7	67.1	67.1	70.3	70.4	104.8
1982	66.6	99.3	99.0	77.9	67.1	67.3	78.5	78.7	116.9
1983	66.9	94.6	94.8	80.7	70.8	70.6	85.4	85.2	120.6
1984	86.3	100.5	99.7	90.0	85.8	86.5	89.5	90.3	104.3
1985	95.7	101.4	102.7	96.5	94.4	93.2	95.2	94.0	100.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	110.7	106.4	107.4	111.0	104.1	103.1	104.3	103.4	100.2
1988	119.4	111.3	111.2	120.6	107.3	107.4	108.4	108.4	101.0
1989	122.4	111.9	112.0	127.3	109.4	109.3	113.8	113.7	104.0

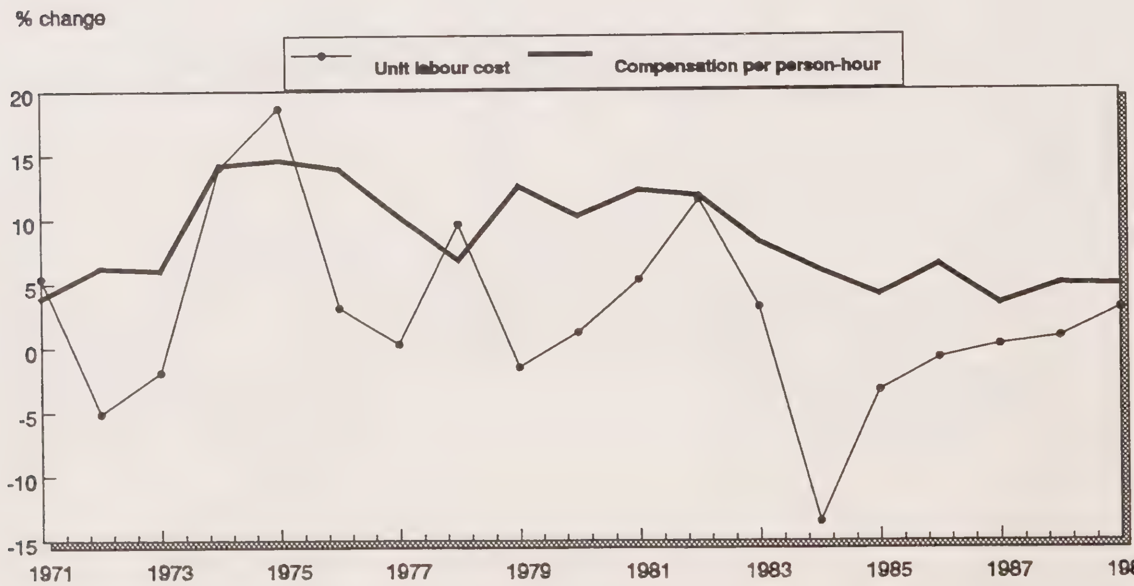


Table 29 - Indices of labour productivity and unit labour cost, non-metallic mineral products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	86.3	97.4	102.7	25.7	88.5	84.0	26.4	25.0	29.8
1972	98.3	101.0	106.1	29.1	97.4	92.7	28.8	27.4	29.6
1973	107.1	106.6	110.8	32.9	100.5	96.7	30.9	29.7	30.7
1974	109.4	110.2	113.5	38.8	99.3	96.4	35.2	34.1	35.4
1975	101.9	107.5	110.7	43.5	94.8	92.1	40.5	39.3	42.7
1976	104.8	106.4	108.4	49.1	98.4	96.6	46.1	45.3	46.8
1977	100.8	102.0	104.0	52.5	98.8	96.9	51.4	50.4	52.1
1978	108.1	104.6	106.4	57.9	103.4	101.6	55.3	54.4	53.5
1979	111.8	106.6	108.0	64.8	104.9	103.5	60.8	60.0	58.0
1980	98.2	105.0	104.0	69.2	93.5	94.4	65.9	66.6	70.5
1981	94.5	104.5	102.9	77.9	90.4	91.8	74.6	75.7	82.5
1982	72.4	90.7	88.2	73.8	79.8	82.1	81.4	83.7	102.0
1983	80.2	88.9	88.0	77.1	90.2	91.1	86.7	87.6	96.1
1984	87.8	91.4	91.2	82.6	96.0	96.3	90.4	90.6	94.1
1985	95.8	94.6	94.2	90.9	101.2	101.7	96.1	96.6	94.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	109.6	106.2	107.8	109.7	103.2	101.7	103.3	101.7	100.1
1988	111.3	108.1	110.5	116.6	103.0	100.7	107.9	105.5	104.7
1989	109.7	107.2	110.1	120.8	102.3	99.6	112.7	109.7	110.1

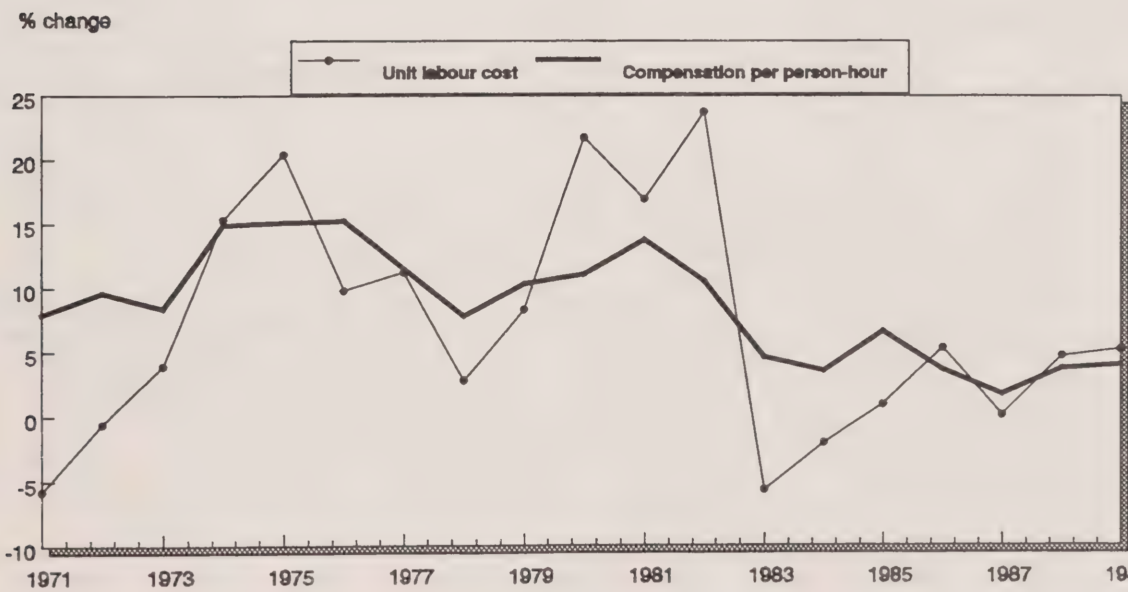


Table 30 - Indices of labour productivity and unit labour cost, refined petroleum & coal products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	72.7	101.3	102.5	23.6	71.8	70.9	23.3	23.0	32.5
1972	70.3	99.5	99.7	25.2	70.7	70.5	25.3	25.3	35.8
1973	103.2	104.3	103.1	28.4	98.9	100.1	27.2	27.5	27.5
1974	105.0	115.0	113.2	35.4	91.3	92.8	30.8	31.3	33.7
1975	113.4	113.0	108.4	41.6	100.4	104.7	36.8	38.4	36.7
1976	106.0	112.4	107.0	46.5	94.3	99.1	41.3	43.5	43.9
1977	132.2	119.9	113.7	54.6	110.3	116.3	45.5	48.0	41.3
1978	118.9	137.2	131.1	64.6	86.6	90.6	47.0	49.2	54.3
1979	97.9	126.5	122.2	65.6	77.3	80.1	51.8	53.7	67.0
1980	96.1	131.8	125.9	75.4	72.9	76.3	57.2	59.9	78.5
1981	111.3	153.1	146.9	100.7	72.7	75.8	65.8	68.5	90.5
1982	103.2	146.4	137.5	116.1	70.5	75.0	79.3	84.5	112.6
1983	102.7	125.7	126.5	111.6	81.6	81.2	88.8	88.3	108.8
1984	103.5	114.5	116.1	107.7	90.4	89.2	94.1	92.8	104.0
1985	100.8	111.9	114.9	107.5	90.1	87.8	96.0	93.6	106.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.3	98.4	100.5	104.8	107.1	104.8	106.6	104.3	99.5
1988	108.0	101.8	100.4	107.7	106.1	107.6	105.8	107.3	99.7
1989	111.4	111.7	110.2	124.3	99.7	101.1	111.2	112.8	111.5

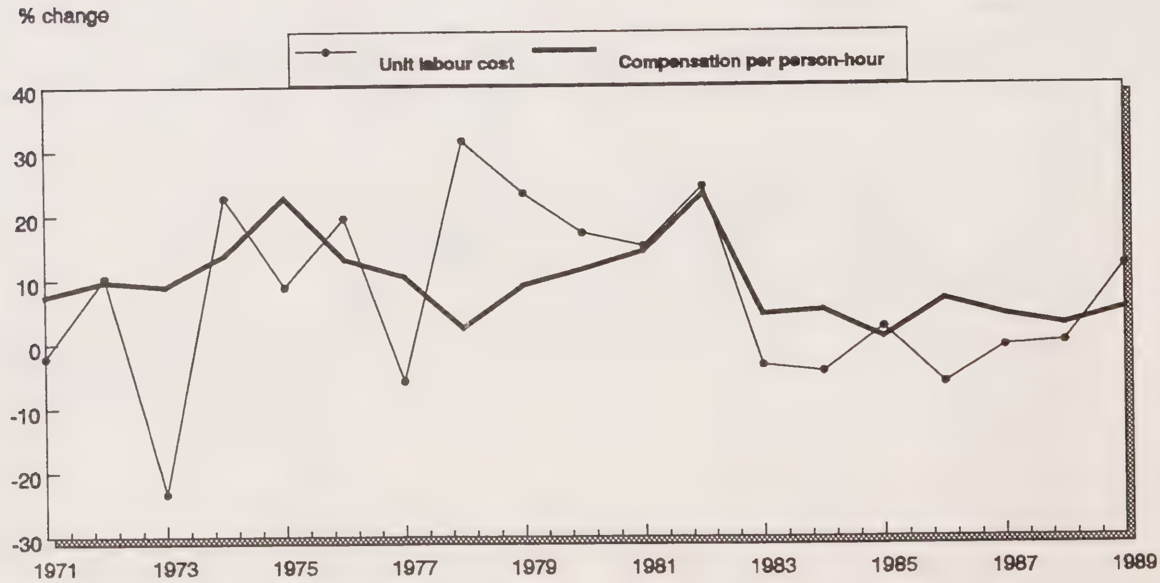


Table 31 - Indices of labour productivity and unit labour cost, chemical & chemical products industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	54.8	89.9	91.2	22.8	60.9	60.0	25.4	25.0	41.6
1972	56.6	87.0	88.0	23.8	65.1	64.3	27.3	27.0	42.0
1973	64.3	90.2	91.2	26.3	71.3	70.5	29.2	28.9	41.0
1974	65.3	93.1	93.5	30.7	70.1	69.8	33.0	32.9	47.1
1975	58.5	93.6	94.3	34.9	62.5	62.0	37.3	37.0	59.6
1976	64.7	92.8	89.0	38.7	69.7	72.7	41.6	43.5	59.8
1977	70.5	95.3	96.0	44.1	74.0	73.5	46.3	46.0	62.5
1978	78.7	96.7	97.6	48.4	81.3	80.6	50.1	49.6	61.6
1979	84.4	99.9	99.2	54.7	84.4	85.0	54.8	55.2	64.9
1980	79.4	99.5	98.5	61.4	79.8	80.6	61.7	62.4	77.4
1981	85.9	102.6	101.1	72.5	83.8	85.0	70.6	71.7	84.3
1982	76.4	101.3	98.7	78.5	75.4	77.4	77.5	79.5	102.8
1983	89.9	100.1	100.0	82.9	89.8	89.9	82.8	82.9	92.2
1984	98.4	100.2	100.4	89.1	98.2	98.0	88.9	88.7	90.5
1985	99.5	99.8	99.5	93.7	99.8	100.0	93.9	94.1	94.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	107.1	101.7	101.1	106.4	105.2	105.9	104.6	105.3	99.4
1988	114.5	107.4	108.1	115.5	106.6	105.9	107.6	106.9	100.9
1989	114.9	108.6	109.8	122.1	105.7	104.6	112.4	111.2	106.3

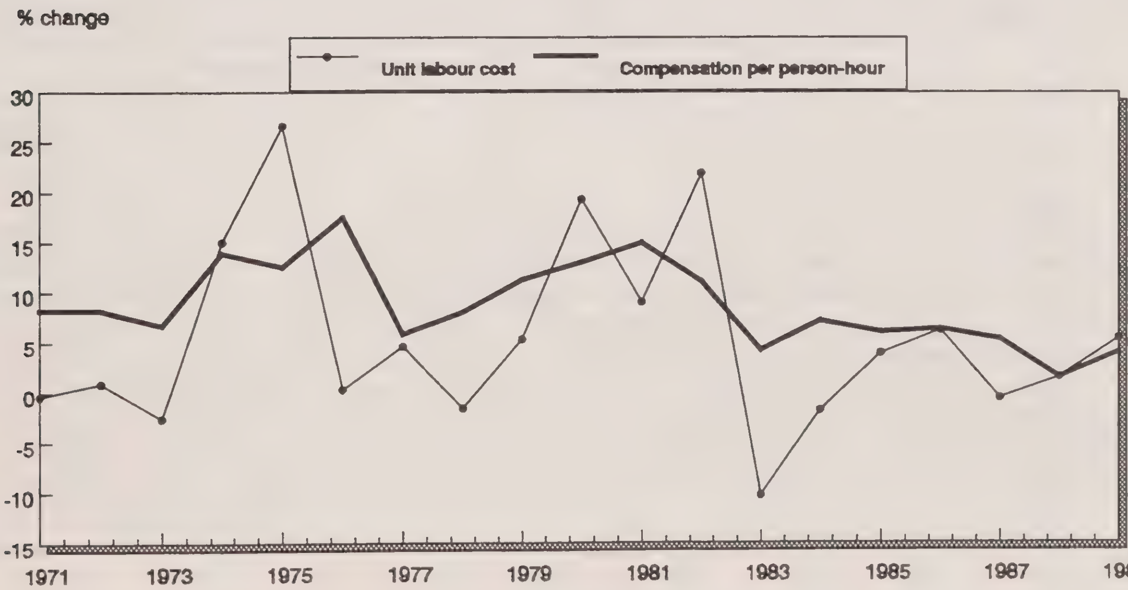
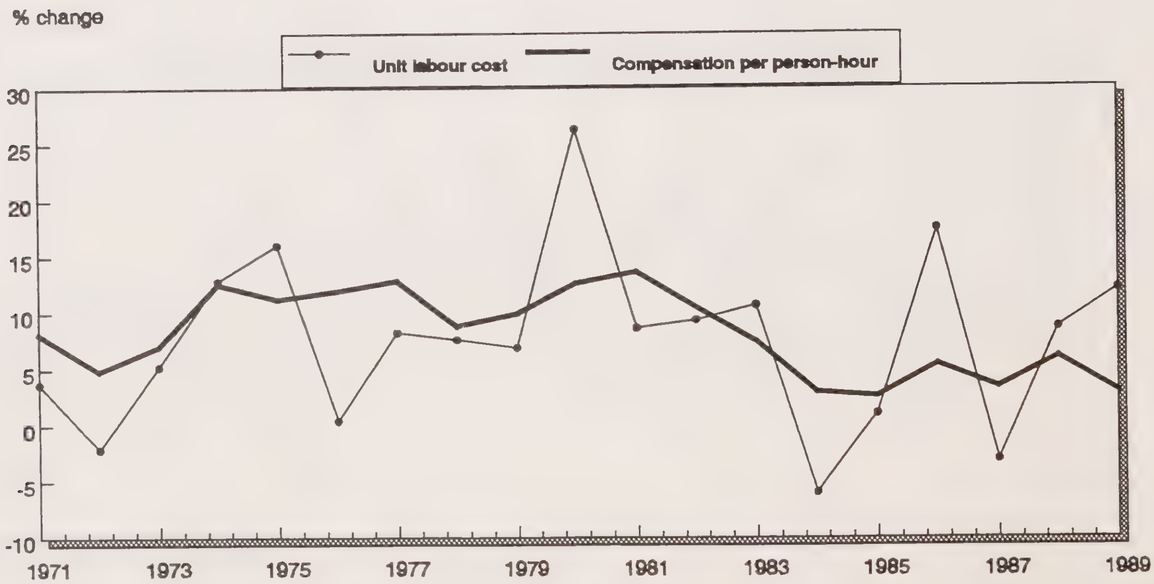


Table 32 - Indices of labour productivity and unit labour cost, other manufacturing industries, (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1971	76.0	82.9	87.2	24.4	91.7	87.1	29.5	28.0	32.1
1972	84.6	86.8	90.7	26.6	97.5	93.3	30.7	29.4	31.5
1973	88.7	90.2	93.4	29.3	98.3	94.9	32.5	31.4	33.1
1974	92.5	94.0	97.8	34.5	98.4	94.6	36.7	35.3	37.3
1975	88.3	94.2	97.3	38.2	93.7	90.7	40.6	39.3	43.3
1976	98.7	95.9	97.7	42.9	102.9	101.1	44.8	44.0	43.5
1977	96.2	89.9	91.2	45.3	107.0	105.4	50.4	49.6	47.1
1978	99.3	92.0	93.2	50.3	108.0	106.6	54.6	54.0	50.6
1979	105.1	94.3	95.8	56.8	111.5	109.7	60.3	59.3	54.1
1980	93.0	94.3	95.2	63.6	98.6	97.8	67.4	66.8	68.3
1981	100.9	97.8	98.6	74.8	103.2	102.3	76.6	75.9	74.2
1982	93.9	91.2	90.8	76.1	102.9	103.4	83.4	83.8	81.1
1983	91.0	90.4	90.7	81.6	100.7	100.3	90.3	90.0	89.7
1984	103.7	93.2	94.4	87.5	111.3	109.9	93.9	92.6	84.3
1985	109.4	95.9	98.1	93.1	114.1	111.5	97.2	94.9	85.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.6	99.4	98.0	101.3	105.2	106.6	101.9	103.3	96.9
1988	109.7	106.9	105.3	115.3	102.6	104.1	107.9	109.5	105.2
1989	105.6	108.5	110.4	124.4	97.3	95.7	114.6	112.7	117.8



APPENDIX 1

About the Measures

1 - Labour Productivity

Ideally, a productivity index would take into account all resources that are used as inputs to the production process. A comprehensive measure, such as this, is called a *total factor*, or, alternatively, a *multifactor* productivity index. This is the focus of Part 2 of this publication. The only resource that is taken into account in producing *labour productivity* is labour input. Although labour input is an important determinant in the level of output, it is not the only one. Therefore, labour productivity is considered to be a *partial productivity measure*.

Although the partial productivity indices described above are appropriate for many analytical uses, they do not describe the sources of economic growth. This is the case because measured changes in output per unit of labour input are not necessarily attributable to the contribution of labour alone, but also to the contribution of other productive resources and to the effectiveness with which all are combined and organized for production.

Due to the fact that there are two alternative measures of labour input, there are, correspondingly, two measures of labour productivity. When labour input is measured in terms of persons at work, the labour productivity measure is *real GDP per person at work*; when it is measured in terms of hours worked the labour productivity measure is *real GDP per person-hour.* Both of these partial productivity indicators are constructed as a ratio of real output to labour input, and are presented in index number form. Real GDP per person-hour may be the more appropriate measure for most applications since it incorporates changes in the average number of hours worked per week, which has a tendency to decline.

2 - Output

The concept of output used in labour productivity measurement is constant price Gross Domestic Product at factor cost by industry (excluding Government royalties on natural resources and rents of Owner-occupied dwellings). The output measures are calculated with 1961 prices for the period 1961 to 1971, with 1971 prices for the years 1971 to 1981 and with 1981 prices for the years 1981 to 1986. Estimates in subsequent years are calculated with 1986 prices. These series were then rescaled to correspond to a 1986 reference year (i.e. 1986=100) for convenience, as 1986 is the base year currently in effect. The rates of growth in the original series are not affected by the choice of reference year. A more complete description of the output measures is found in *The Input-Output Structure of the Canadian Economy 1961-1981* (Catalogue 15-510) and in *The Input-Output Structure of the Canadian Economy in Constant Prices, 1961-1981* (Catalogue 15-511).

The productivity measures pertain to business sector industries only[28]. The output of non-business sector industries is difficult to measure because it is not normally sold on the market. This means that in general, output prices are not available for this sector. The conventional measure of real output for non-business sector industries is therefore constructed by deflating the value of output with input prices. Such an approach, however, does not allow a meaningful measurement of productivity to be calculated.

3 - Labour Input

In principle, labour input should cover all labour services expended to produce a given output. This report presents two measures of labour services: persons at work and person-hours worked. Neither of these measures takes into account the changing quality of labour input.

Persons at work denote all *paid* and *other-than-paid* persons engaged in the production of output. Other-than-paid workers include self-employed workers and unpaid family workers.

Person-hours worked is the sum of person-hours spent at the place of employment by persons at work, and therefore differs from a measure of "person-hours paid" by excluding vacation time, holidays, time lost due to illness, accidents, etc.

4 - Labour Compensation

Labour compensation is a measure of the value of labour services engaged in the production process. It includes all payments in cash or in kind by domestic producers to persons at work as remuneration for work, including wages, salaries and supplementary labour income of paid workers, plus an imputed labour income for self-employed workers. Statistics on labour compensation reported here represent the most comprehensive labour cost data available for all industries at the present time since they include both cash payments and supplements and cover all remunerated persons at work.

The estimate of the value of labour services of self-employed persons is an imputed value. The imputation is based on the assumption that the value of an hour worked by a self-employed person is the same as the value of an hour worked by an average paid worker in the same industry. This assumption is based on the premise that labour services are contracted on a temporal basis, and a measure of labour compensation should not reflect returns on investment or risk taking. An adjustment is made in the case of self-employed persons such as doctors, dentists, lawyers, accountants and engineers. In these cases, the average earnings of paid workers in the same industry tend to be lower than the earnings of the self-employed workers. Although self-employed workers are in majority in the industry, the imputation of earnings for these workers at the average rate in the industry tends to underestimate the income of the self-employed. In this case, direct evidence on average labour income of these workers is introduced.

Unpaid family workers, while not directly recompensed for their services, are not a free resource, and their contribution is reflected in the net income of the firm where they are employed. However, no labour income is imputed to unpaid family workers. There is no valid basis for measuring the value of their services, and it is judged that less error is generated by their exclusion from measures of labour compensation than by

[28] *Further detail on the industry coverage of the productivity measures in this publication can be found in Appendix 3 of Part 1.*

imputing labour income to them at the same rate as paid workers. The number of unpaid family workers is insignificant in most industries.

5 - Unit Labour Cost

Unit labour cost is the ratio of labour compensation to real GDP. It is a measure of the cost of labour per unit of real output. Unit labour cost can also be viewed as the ratio of average compensation to labour productivity; thus, unit labour cost will increase when average compensation grows more rapidly than labour productivity.

6 - Absolute Values

All time series in this report are presented as indices taking a value of 100 in 1986. This form emphasizes relative change, as opposed to levels, as being important in the construction of productivity measures and related cost series. One can reconstruct the absolute values underlying the indices of persons at work, person-hours, real gross domestic product and labour compensation. These absolute values are of some interest as they indicate the level of those series. Nevertheless, the growth rate of the series is the same whether it is calculated from the index or the absolute values.

Text table 1 gives the absolute values underlying the indices for the year 1986. To calculate the absolute values corresponding to the published indices the following procedure can be followed:

$$\frac{\text{Index}}{100} \times \text{1986 value from Text table 1.}$$

The measurement of employment, output, and the other series mentioned above are subject to some, usually indeterminate, margin of error. These errors usually have a larger impact on the level of the estimates than on their growth rates. While such statistical errors will also have some effect on measures of relative change, it can be expected that their effect will be more serious when comparisons of absolute levels are attempted.

Text table 1

Absolute values of labour productivity and unit labour cost, 1986

Industry Title	Real gross domestic product	Persons at work	Person-hours	Labour compen-sation
	$'000,000	'000	000,000	$'000,000
Business sector industries	335,673	8,553	15,298	225,727
Business sector - excluding agricultural and related services industries	324,616	8,059	14,216	220,196
Business sector - services	173,374	5,244	8,993	126,868
Business sector - goods	162,299	3,309	6,305	98,859
Agricultural and related services industries	11,057	493	1,082	5,531
Manufacturing industries	86,789	1,804	3,341	56,919
Construction industries	28,082	673	1,242	23,449
Transportation and storage industries	20,254	459	856	14,857
Communication industries	13,248	200	372	7,628
Wholesale and retail trade industries	51,581	1,991	3,409	41,443
Community, business and personal services industries	52,119	1,990	3,286	41,921

APPENDIX 2

Sources of Data

1 - Output

The output data used to calculate the indices of labour productivity and unit labour cost are the estimates of constant price Gross Domestic Product at factor cost by industry. The following sources are utilized: *Indexes of Real Domestic Product by Industry, 1961 Base*, (Catalogue 61-506), for the years 1946-1961. For these years, only index values of output are available. For the years 1961 to 1981, *The Input-Output Structure of the Canadian Economy in Constant Prices 1961-1981* (Catalogue 15-511); for the years 1982 to 1989, *The Input-Output Structure of the Canadian Economy in constant prices* (Catalogue 15-202); for the years 1990 and 1991 *Gross Domestic Product by Industry* (Catalogue 15-001) is used. The data on real GDP in the Finance, insurance and real estate industries excludes real GDP of Government royalties on natural resources and rents of Owner occupied dwellings.

2 - Labour Input

This appendix presents two measures of labour input: the annual average number of persons at work and the number of person-hours worked by these persons at work. The data sources for both of these measures are given below.

An explanation of the data sources for the labour input measures for the years 1946 to 1961 can be found in: *Indexes of Output Per Person Employed and Per Man-hour in Canada, Commercial Non-agricultural Industries, 1947-1963* (Catalogue 14-501).

i) Benchmark Data Up to 1989[29]

Persons at work. Persons at work are made up of two groups: *paid workers* and *other-than-paid workers*. The other-than-paid workers include self-employed and unpaid family workers.

Paid workers. The number of paid workers in agriculture, fishing and trapping industries for all years is taken from the Labour Force Survey (Catalogue 71-001). Multiple job holders are added from 1975.

[29] *For further details the reader is referred to: Karnail S. Gill and Monique Larose, "Sources and Methods of Estimating Employment by Input-Output Industries 1961-1989" Input-Output Division Technical Series, #47, 1991.*

Estimates of Employees by Province and Industry, 1961-1976 (Catalogue 72-516), and monthly Catalogue 72-008 are the sources for the years up to 1982 for the following industries:

Logging and forestry industries;
Construction industries;
Transportation and storage industries;
Communication industries;
Other utility industries;
Wholesale and retail trade industries;
Finance, insurance and real estate industries;
Community, business and personal services.

For the period after 1982 up to 1987, the publication *Employment Earnings and Hours* (Catalogue 72-002) was the data source used for the above industries. In addition, other sources of information are used as follows:

In transportation and storage industries the following publications were used to derive the number of paid workers: *Air Carrier Operations in Canada* (Catalogue 51-002), *Rail Transport* (Catalogue 52-212; 52-215 and 52-216), *Gas Utilities: transportation and distribution systems* (Catalogue 57-205) and *Oil Pipeline Transport* (Catalogue 55-201), *Passenger Bus and Urban Transit Statistics* (Catalogue 53-215).

In communication industries, paid workers data were obtained from: *Radio and Television Broadcasting* (Catalogue 56-204); *Cable Television* (Catalogue 56-205), and *Canada Post Corporation Annual.*

For 1988 and 1989, the data source for logging and forestry industries, other utility industries and finance, insurance and real estate industries remained *Employment, Earnings and Hours* (Catalogue 72-002) while year-to-year change from Labour Force Survey was applied to 1987 absolute values for construction industries and community, business and personal services (excluding educational service industries and hospitals). For the wholesale and retail trade industries, the sources for 1988 is *Employment, Earnings and Hours* (Catalogue 72-002); for 1989, the year-to-year change from Labour Force Survey was applied to 1988 absolute value. The data sources for transportation and storage industries and the communication industries remained unchanged.

Out of the above list of industries, the construction industries need a special mention. In Input-Output concept all paid workers in construction activity taking place in other sector or industry is rerouted to the construction industries of the Business Sector. Thus, the number of paid workers engaged in construction activity in these other industries is calculated as the ratio between own-account construction and the average wage of the industry in which the activity took place.

The mining, quarrying and oil well industries are broken down into four major groups according to the 1980 SIC:

1. Mining industries;
2. Crude petroleum and natural gas industries;
3. Quarry and sand pit industries;
4. Service industries incidental to mineral extraction.

The primary data source used for the first three groups for 1961-1989 is the *General Review of the Mineral Industries*, (Catalogue 26-201). The only exception to this is the oil sands industry, which falls into the second major group, crude petroleum and natural gas industries. This industry is not covered in the *General Review of the Mineral Industries*, and therefore the data used for this industry are taken from the *Survey of Employment Payroll and Hours*. The last major group, service industries incidental to mineral

extraction, includes three industries according to the 1970 SIC: Contract Drilling for Petroleum, Other Contract Drilling and Miscellaneous Services Incidental to Mining. For the years up to 1976 the number of paid workers in the first two industries is obtained from *Contract Drilling for Petroleum and Other Contract Drilling* (Catalogue 26-207). Beginning in 1977 the number of paid workers in other contract drilling is published in Catalogue 26-201 and the number of paid workers in contract drilling for petroleum is estimated from other information pertaining to the industry up to the year 1982. After that, Catalogue 72-002 has been used. The remaining part of the mining, quarrying and oil wells industries is measured using decennial census and the Catalogue 72-002 from 1983-1989.

The source of the number of paid workers in manufacturing for 1961-1989 is *Manufacturing Industries of Canada: National and Provincial Areas* (Catalogue 31-203) a publication from the annual survey of manufactures. These data are adjusted for improved coverage in the 1970's.

Other-than-paid workers. For manufacturing industries the number of other-than-paid workers is derived from the series on working owners and partners in *Manufacturing Industries of Canada: National and Provincial Areas* (Catalogue 31-203). The numbers reported for the 1970's were adjusted to effect consistency with output data. For all other industries *Labour Force Survey* (Catalogue 71-001) is used. The number of self-employed doctors and dentist (Homes for personal and nursing care and other health and social services, part of community business and personal services) are obtained from *Taxation Statistics*, Revenue Canada Taxation (Catalogue no. RV 44-1991) since 1961.

Starting with 1988, an important change was introduced in the methodology of employment estimation used in productivity measures. The persons at work level obtained from the aggregation of industry estimates derived from different sources is reconciled to the growth rate of total persons at work from the *Labour Force Survey.* Thus, the growth rate from this survey is used as the benchmark. When a difference occurs between the two estimations, the difference is prorated between trade industries and community, business and personal industries (excluding educational service industries and hospitals) as the emloyment data for these industries are considered less reliable. The same methodology applies to the preliminary data below.

ii) Preliminary Data - 1990 and 1991

For the paid workers, the year-to-year change from *Labour Force Survey* (LFS) and *Survey of Employment Payroll and Hours* (SEPH) was applied to the 1989 absolutes values. For other-than-paid workers, the data were obtained from *Labour Force Survey.*

Person-hours worked. With the exception of manufacturing industries the number of person-hours worked in each industry is obtained as the product of the number of persons at work and the average number of hours worked in each year.

In manufacturing, the basic source is the *Annual Survey of Manufactures*, supplemented by other survey results as noted. Distinct calculations are made for production workers and for salaried employees, total person-hours worked being obtained as the sum of the two elements. The adjustments effected to the published levels of persons at work in the 1970's also operate on person-hours worked. For production workers, the number of person-hours worked is obtained from tabulations of returns to the *Annual Survey of Manufactures.* For salaried employees, the methodology for estimating hours worked is slightly different in the early part of the period, up to 1969. The discontinuance of the survey *Earnings and Hours of Work in Manufacturing* at that time necessitated a different technique in the later period. This survey yielded a value of average hourly earnings applicable to the earnings of salaried employees. With hourly earnings, payroll values are converted into estimated hours paid. The survey of *Labour Costs in Canada* covers the manufacturing industry in selected years, and this provides a basis for converting hours *paid* to hours *worked.* For the years after 1969, the occasional surveys of *Labour Costs in Canada* provide the basis for

estimating hours worked by salaried employees. From 1983 onwards the *Annual Survey of Manufactures* provides tabulations from which it is possible to estimate average hours worked per week for salaried employees.

Due to the fact that the 1987 entries on person-hours worked in the *Annual Survey of Manufactures* were captured but were not edited, in-house estimates of person-hours were made in order to maintain the continuity of the labour productivity time series. These estimations cover the major group level (M level). The estimates of person-hours by industry were derived either from the *Survey of Labour Force* (LFS) or the *Survey of Employment, Payroll and Hours* (SEPH) for each of the 21 manufacturing major groups. The resulting hours estimates for the total of manufacturing were reconciled with average hours worked from the LFS for total manufacturing since, historically, the level of hours of the *Annual Survey of Manufactures* is very close to the level of hours given by LFS at this level of aggregation. Hours worked by working owners and partners were estimated for 1987 at the M level on the assumption that its growth rate with respect to 1986 equals that for paid workers. For 1988 person-hours worked for the paid workers were derived mostly from the Survey of Manufacturers (15 major groups) from SEPH (4 major groups) and (2 major groups) from L.F.S. For all years up to 1986 and the year 1988 average hours worked by working owners and partners in manufacturing are based on the hours worked of salaried employees. In 1989, hours worked by both categories of workers were drawn from the *Annual Survey of Manufactures* for all major groups.

For recent years, when the *Annual Survey of Manufactures* is not yet available, the average hours worked for the paid workers and working owners and partners in manufacturing is based on the growth rate of average hours worked from LFS, calculated as explained below.

Average hours worked for industries other than manufacturing are calculated from tabulations of the *Labour Force Survey*. Estimates are made independently for paid workers and other-than-paid workers; from 1975 the latter class is further divided into self-employed workers and unpaid family workers. Multiple job holders are included from 1975.

Monthly data from the *Labour Force Survey* refer only to the survey week. The survey week can be taken as representative of other weeks in the month except for holidays and strikes[30]. The procedure is to first adjust the survey weeks for the effect of strikes and holidays falling in that week. This yields a nominal value of the hours worked in that week if there were no strikes or holidays. The survey generates the data required to make these corrections. Corresponding nominal values for non-survey weeks are estimated by interpolation. These nominal values for each week of the year are then adjusted by the known impact of strikes and/or holidays on that week. The necessary data on strikes are tabulated by Labour Canada. Only the paid worker series is adjusted for strikes. The holiday adjustment is based on statutory holidays and studies of employment practices in industries. Average annual hours worked per week are calculated as the average of the weekly values adjusted for strikes and holidays. The number of hours worked per year is simply the weekly average multiplied by the number of weeks in the year. The number of weeks in the year is not taken as constant, but reflects the vagaries of the calendar. A calendar year encompasses 52 complete weeks plus one, or in leap years, two extra days. If these extra day(s) fall on a normal day of rest the year is considered to have 52 weeks even. If not, the number of weeks is greater. There can be a slight variation in the year-to-year change in hours worked on this account.

[30] *For a complete description of this methodology, see: Maryanne Webber, "Estimating Total Annual Hours Worked from the Canadian Labour Force Survey", Input-Output Division Technical Series, #51, Statistics Canada, April 1983.*

3 - Labour Compensation

There are two components to labour compensation: labour income of paid workers and an imputed labour income of self-employed workers. The labour income of paid workers is taken from the following sources: *The Input-Output Structure of the Canadian Economy 1961-1981* (Catalogue 15-510), the same publication for 1982 and following years (Catalogue 15-201) except for the two most recent years where it is taken from the *Estimates of Labour Income* (Catalogue 72-005) after adjustments are made to reroute own-account construction to construction industries of the business sector.

Labour income of other-than-paid workers. In addition to the labour income of paid workers, labour compensation includes an imputed labour income for all other-than-paid workers except unpaid family workers. The imputation is based on the assumption that the hourly income for the labour of self-employed persons is the same as that of paid worker in the same year and the same industry.

For the years to 1975 the hours worked of self-employed workers were estimated as the ratio of self-employed persons to other-than-paid workers times the hours worked by other-than-paid workers. From 1975, as noted above, the hours worked by self-employed persons are estimated directly.

An adjustment is made in the case of some professional persons, such as doctors, dentists, lawyers, accountants and engineers. These occupations are largely self-employed, but the average earnings of paid workers in the same industry division underrepresent the earnings of these occupations. In these cases data on the number of self-employed professional persons and their average labour income back to 1961 are obtained from *Taxation Statistics*, Revenue Canada Taxation, (Catalogue No. RV 44-1991), for the year 1989 and similar publications for other years.

APPENDIX 3

Aggregation Parameters for Labour Productivity Measures

The statistics presented in this publication refer to business sector industries, as defined in the Canadian System of National Accounts. There are no corresponding statistics for non-business sector industries due to difficulties in the measurement of real output in this sector, as explained in Appendix 1.

The most detailed account of the business sector is defined in terms of individual industries from the *Standard Industrial Classification* (SIC). Aggregation of SIC industries generates 154 link (L) level industries (excluding the fictive industries), 47 medium (M) level industries and 13 small (S) level industries.

There are a total of 32 statistical tables on labour productivity appearing in Part 1 of this publication. Tables 1 to 4 are produced for special aggregates of business sector industries. Tables 5 to 11 correspond to selected S level business sector industries (except for Table 10 for which two S level industries have been combined). The remaining tables, 12 to 32, are associated with the M level manufacturing industries.

The following text tables show the concordance between the classification of industries in the Canadian System of National Accounts and the Canadian Standard Industrial Classification.

Text table 1

Concordance between "S" level industry codes, standard industrial classification codes (SIC's) and link codes

S Level Industries S Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
1	Agricultural & related services ind.	011-017, 021-023	001-021	001-021	1
2	Fishing & trapping industries	031-033	041-047	041-047	2
3	Logging & forestry industries	0411, 0412, 0511	031, 039	031, 039	3
4	Mining, quarrying & oil well industries	0611-0617, 0619, 0621-0625, 0629, 063, 071 081, 082, 091, 092	051-052 057-059, 061, 064, 071-073, 079, 083 087, 096, 098, 099	051-059 061, 063-066, 071, 073, 077, 079, 083 087, 092-099	4-13
5	Manufacturing industries	(See M level below)			14-108
6	Construction industries	401-449	404-421	404-421	109-117
7	Transportation & storage industries	451-459 461, 471 479, 996 9991	501-509 512, 515-517, 519 524, 527	501, 502 504-509 512, 519 515-517 524-527	118-128
8	Communication industries	481-483 4841	543-545 548	543-545 548	129-131
9	Other utility industries	491, 492 499	572, 574 579	572, 574 579	132-134
10,11	Wholesale and retail trade industries	501-599 601-692	10722,2611 602-629 631-699	1292, 2611 602-629 631-699	135-136
12	Finance, insurance & real estate	701-705 709, 711-729, 731-733, 741-743, 7499 7511, 7512 759, 761	7011-7016 7019, 703, 705, 707 715, 7211, 7212, 735, 7371	702, 704 7311, 7312 735, 7371	137-139
13	Community, business, personal services	771-777, 779, 851-859, 861 8621, 863 865, 866 8671, 8679 868, 8691-8693, 8699 911-914, 921 922, 961-966, 969 971, 972 973, 979 982, 983 991-995 9999,4842	801-809 821-827 841-845 849, 851-855, 861-864, 866 867, 869 871, 872 874, 876 877, 879 881-886 891, 8931 894-899	801-809 821,823-827, 851 853-859 861, 862 864, 866 869, 871 872, 874-879, 891 8931, 894-899	142-154

Text table 2

Concordance between "M" level industry codes, standard industrial classification codes (SIC's) and link codes

M Level Industries - Manufacturing

M Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
8	Food industries	1011, 1012 102-104 1051-1053 106, 1071 1072, 1081-1083, 109	101-108	101, 103 105, 107 111, 112 123-125 128, 1291 131, 133 135, 139	14-24
9	Beverage industries	111-114	109, 145, 147	141, 143	25-28
10	Tobacco products industries	121, 122	151, 153	151, 153	29
11	Rubber products industries	151-159	1623, 1629	163, 169	30
12	Plastic products industries	161-169	1651, 27332	27332, 3851	31
13	Leather & allied products industries	1711, 1712 1713, 1719	1624, 172 174, 179	161, 172 174, 179	32,33, 34
14	Primary textile & textile products industries	181-183 191-193 199	181-187, 189, 2391	183, 193, 197, 201 211-216 218, 221 223, 2292, 2299,2391	35-40
15	Clothing industries	243-245, 249	175, 231 2392, 243-249	175, 231 2392, 242-249	41, 42
16	Wood industries	251, 252 254, 256 258, 259	251, 252 254, 256 258, 259	251, 252 254, 256 258, 259	43-47
17	Furniture & fixture industries	261, 264 269	2619, 264 266	2619, 264 266	48-50
18	Paper & allied products industries	271-273 279	271, 272 2731, 2732 27331, 274	271, 272 2731, 2732 27331, 274	51-54
19	Printing, publishing & allied industries	281-284 8932	286-289, 8932	286-289,	55, 56
20	Primary metal industries	291, 292 294-297 299	291, 292 294-298	291, 292 294-298	57-63
21	Fabricated metal products industries	301-309	301-309	301-309	64-71
22	Machinery industries	311, 312 319	311, 315 316	311, 315 316	72-74
23	Transportation equipment industries	321, 323-329	1652, 188 321, 323-329	2291, 321 323-329 3852	75-81
24	Electrical & electronic products	331-339	268, 318 3399 331-336, 338, 3391	268, 318 331, 332 334-339	82-89

Text table 2

Concordance between "M" level industry codes, standard industrial classification codes (SIC's) and link codes (concluded)

M Level Industries - Manufacturing

M Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
25	Non-metallic mineral products industries	351, 352 354-359	351, 352 353-359	341, 343 345, 347 348, 351-357, 359	90-95
26	Refined petroleum & coal products	361, 369	365, 369	365, 369	96
27	Chemical & chemical products industries	371-377 379	372-379	371-379	97-103
28	Other manufacturing industries	391-393 397, 399	391-393 397, 399	219, 381-384, 393, 395, 397-399	104-108

Special Aggregations

Industry Title	S code
Business sector industries	1-13
Business sector - goods	1-6, 9
Business sector - services	7-8, 10-13
Business sector - excluding agricultural & related services	2-13

APPENDIX 4

Quality of Labour Productivity Estimates and Related Data

Like other components of the Canadian System of National Accounts (CSNA), the labour productivity and unit labour cost measures presented in this publication are derived from a variety of sources and subjected to various adjustments. Assessing the quality of the data thus raises difficulties similar to those pointed out in other CSNA publications. The labour productivity and related data presented in this publication are derived from:

(1) input-output tables, and real gross domestic product by industry, and,

(2) various surveys and censuses containing information on employment, hours worked, and labour income.

Quality ratings presented in text tables 1 and 2 are provided for the latest benchmark year noted on the table. Data quality ratings for previous years may be found in preceding issues of this publication; data for the period following the benchmark year are deemed to be of lesser quality although no quality rating is provided.

In rating various data our main interest lies more in year-to-year changes than in the levels of various constructs. No attempt will be made to establish a cardinal rating of various constructs used in productivity. However, based on an informed opinion, an ordinal rating will be attempted. The rank of 1 means most reliable, the rank of 2 means reliable and the rank of 3 means acceptable. Any series which do not support a rank of 3 is not published. Ratings are provided for the following series:

(i) Real GDP at factor cost;
(ii) Persons at work;
(iii) Person-hours worked;
(iv) Labour compensation;
(v) Real GDP per person at work;
(vi) Real GDP per person-hour;
(vii) Compenstion per person at work;
(viii) Compenstion per person-hour;
(ix) Unit labour cost.

Real GDP. The quality ratings of real GDP have been taken from Appendix A of the publication: *The Input-Output Structure of the Canadian Economy, 1989* (Catalogue 15-201).

Persons at work. For these data the rankings have been determined as follows: in general, a rank of 1 has been assigned to the most reliable estimates that are based completely on censuses[31], surveys or administrative records with minimum adjustments for coverage, valuation and classification. A rank of 2

[31] *See Appendix 2 of Part 1 for a full description of data sources.*

has been assigned to less reliable census and survey data with adjustments for coverage. A rank of 3 has been assigned to all other sources, for example, household surveys (*Labour Force Survey*), and decennial censuses, unless experience indicates otherwise. The main reason that household surveys or decennial censuses have been given this ranking is because of lack of precision of the responses in household surveys or population censuses to questions related to industrial classification as compared to establishment-based censuses or surveys. However, the quality rating of series taken from sample surveys, like the *Labour Force Survey*, also depends on the size of the sample. Aggregate series may, therefore, have higher ratings than disaggregated series. Likewise, at a given level of aggregation, large industries may have a better quality rating than small industries.

According to these criteria, the employment data from the Annual Survey of Manufactures at the S level of aggregation in 1989 carry a ranking of 2. The reason it has been assigned a ranking of 2 and not 1 is because in the revised data for 1989, 19.4% of the paid workers data are taken from tax returns and the small forms. Out of that percentage 14.2% are estimated from tax files where employment is not reported: data on wages and salaries are used to estimate the number of paid workers in this portion of the universe. For 1989, the following criteria has been used for ranking the employment data for various industries at M level of aggregation in Manufacturing. A ranking of 1 has been assigned where less than 10.0% of the employment data are taken from the tax returns. A ranking of 2 has been assigned to data where more than 10.0% but less than 20.0% of the data is from the tax returns. A ranking of 3 has been assigned where more than 20.0% data are from the tax returns.

The employment data for the agriculture industry are taken from the Labour Force Survey, which is a household survey. For this industry, it is the only source of employment estimates. Also, in the agriculture industry, 60.8% of the workers are "other-than-paid" where the quality of data is expected to be slightly lower than for "paid workers". The employment data for the agriculture industry, therefore, has been assigned a ranking of 3. For the remaining industries in the business sector of the economy, the employment data for paid workers originates from either establishment-based surveys (*Estimates of employees* up to 1982 and *Survey of Employment, Payroll and Hours* from 1983 onwards) or from a variety of other surveys. The employment data for the other-than-paid workers is obtained from the *Labour Force Survey*. Therefore, in the case of all remaining industries for which productivity and unit labour cost data are published at the S level of aggregation, the quality rating of the employment data is determined as follows: a ranking of 1 has been assigned to the industry where up to 10.0% of the persons at work are other-than-paid. For industries where this ratio is between 10.0% and 20.0%, the ranking is 2. For industries where this ratio is greater than 20.0%, the ranking of 3 has been assigned to the employment data. However, at the aggregate business sector level, errors tend to cancel out and it is felt that a quality rating of 1 could be attributed to the data.

Person-hours worked. The number of person-hours worked in each industry except manufacturing is obtained as the product of the number of person at work and the average number of hours worked in each year. Average hours data from the *Labour Force Survey* are good quality data and where comparisons are possible e.g. in manufacturing, average hours from both sources show very similar year-to-year changes. As a separate construct, the average hours worked data have a quality rating of 2. Since person-hours worked data are a product of the number of persons at work and the average number of hours worked, the quality rating of person-hours is the rounded average of the two variables. In manufacturing, the person-hours worked data come from the Annual Survey of Manufactures where distinct calculations are made for production workers and for salaried employees, total person-hours worked being obtained as the sum of two elements. However, even for production workers, the person-hours worked are mostly estimated from person-hours paid. For salaried employees, it is derived using average standard work week and vacation weeks paid. Since the hours worked data at the S level of aggregation in manufacturing are simply a sum of the hours worked data at the M level of aggregation (there being no compensating errors) the quality rating of person-hours worked data at both S and M level of aggregation

has been set at 2. Aggregate business sector hours have been attributed a rating of 1 because of compensating errors.

Labour compensation. Labour compensation is the sum of labour income of paid workers and the imputed labour income of self-employed workers. Since the estimates of labour income in the benchmark year come from tax data and have been subjected to various Input-Output adjustments, these have a rating of one. However, in some industries (for example Agriculture, Construction, Retail Trade) there is a large number of self-employed workers for whom there is no direct measure of labour income and an imputation is made on the assumption that the hourly compensation of self-employed workers equals that of paid workers. Therefore, at aggregation level S the following rating criteria has been used. For industries, where the ratio of self-employed workers to persons at work is less than 10.0% the rating of labour compensation data is 1, where this ratio is more than 10.0% but less than 20.0% the rating is 2. For a ratio greater than 20.0% a rating of 3 has been assigned. According to these criteria compensation data for all manufacturing industries at M level of aggregation have been assigned a quality rating of 1.

Labour productivity and *other ratios.* The quality ratings of ratios like real GDP per person at work, real GDP per person-hour and unit labour cost have been calculated as the rounded weighted average of the ratings for the two variables. For example, if the rating for real GDP is 1, and employment is 2, then the rating for real GDP per person at work is 2.

Text table 1

Quality ratings of labour productivity and related data at aggregation level S and business sector, 1989

Industry title	Real GDP	Persons at work	Person-hours	Labour Compen-sation	Real GDP per person	Real GDP per person-hour	Compen-sation per person	Compen-sation per person-hour	Unit Labour Cost
Agricultural & related services ind.	2	3	3	3	3	3	3	3	3
Manufacturing industries	1	2	2	1	2	2	2	2	1
Construction industries	3	2	2	2	3	3	2	2	3
Transportation & storage industries	2	2	2	2	2	2	2	2	2
Communication industries	2	1	2	1	2	2	1	2	2
Wholesale and retail trade industries	3	2	2	2	3	3	2	2	3
Community, business, personal services industries	2	2	2	3	2	2	3	3	3
Business sector	1	1	1	2	1	1	2	2	2

Text table 2

Quality ratings of labour productivity and related data for manufacturing industries at aggregation level M, 1989

Industry title	Real GDP	Persons at work	Person-hours	Labour Compen-sation	Real GDP per person	Real GDP per person-hour	Compen-sation per person	Compen-sation per person-hour	Unit Labour Cost
Food	1	1	2	1	1	2	1	2	1
Beverage	2	1	2	1	2	2	1	2	2
Tobacco	2	1	2	1	2	2	1	2	2
Rubber	1	1	2	1	1	2	1	2	1
Plastic	1	3	2	1	2	2	2	2	1
Leather & allied	1	2	2	1	2	2	2	2	1
Primary textile & text. prod.	1	2	2	1	2	2	2	2	1
Clothing	1	1	2	1	1	2	1	2	1
Wood	2	2	2	1	2	2	2	2	2
Furniture & fixture	1	3	2	1	2	2	2	2	1
Paper & allied	1	1	2	1	1	2	1	2	1
Printing, publishing & allied	2	3	2	1	3	2	2	2	2
Primary metal	1	1	2	1	1	2	1	2	1
Fabricated metal	1	3	2	1	2	2	2	2	1
Machinery	1	3	2	1	2	2	2	2	1
Transp. equip.	2	1	2	1	2	2	1	2	2
Electrical & electronic	2	2	2	1	2	2	2	2	2
Non-metallic mineral prod.	1	2	2	1	2	2	2	2	1
Refined petroleum & coal prod.	2	1	2	1	2	2	1	2	2
Chemical & chemical prod.	2	1	2	1	2	2	1	2	2
Other manufacturing	2	3	2	1	3	2	2	2	2

APPENDIX 5

Algebraic Presentation of Indices

1 - Productivity Index

The basic formula of labour productivity used throughout this report may be expressed as follows:

$$\textit{Index of Productivity} = \frac{\textit{Real GDP index}}{\textit{Labour input index}} \text{ X } 100$$

or, in algebraic form:

$$P_t = \left[\frac{Q_t / Q_o}{L_t / L_o}\right] \text{ X } 100$$

Where ***P*** is the index of labour productivity, and ***Q*** and ***L*** are constant price output (Real Domestic Product) and the volume of labour input respectively, at the appropriate level of aggregation, and the subscripts ***o*** and ***t*** refer to the base year and any other year.

2 - Unit Labour Cost Index

Similarly, the index of unit labour cost may be expressed as follows:

$$\textit{Unit Labour Cost Index} = \frac{\textit{Labour Compensation Index}}{\textit{Real GDP Index}} \text{ X } 100$$

or, in algebraic form:

$$U_t = \left[\frac{C_t / C_o}{Q_t / Q_o}\right] \text{ X } 100$$

By dividing both the numerator and the denominator of the unit labour cost expression by the labour input index, the unit labour cost index can also be expressed as a ratio of the average labour compensation index to the labour productivity index. That is:

$$U_t = \frac{\textit{Average Labour Compensation Index}}{\textit{Productivity Index}} \times 100$$

Where U is the unit labour cost index, C is labour compensation; Q and L and the subscripts were defined above.

3 - Labour Productivity, Unit Labour Cost and Average Labour Compensation

The definitions of P, Q, L, U and C were given above, but expressed here as absolutes. If W is denoted as average labour compensation, then by definition:

$$P = Q/L$$

$$W = C/L$$

$$U = C/Q \text{ or}$$

$$U = W/P$$

The growth in these variables can be presented as

$$P_t = P_o (1 + p)^n$$

$$W_t = W_o (1 + w)^n$$

$$U_t = U_o (1 + u)^n$$

Where the lower case letters refer to the rates of growth and the subscripts o and t and superscript n refer to time. P_o, W_o and U_o represent the values in the initial year o and P_t, W_t and U_t represent the values of P, W and U in the year t with n being the time interval in years between the year t and the year o. In the year t:

$$U_t = W_t / P_t$$

Substituting the preceding three relationships into the above equation yields

$$U_o (1 + u)^n = \frac{W_o (1 + w)^n}{P_o (1 + p)^n}$$

which simplifies to

$$U_o (1 + u)^n = U_0 \left[\frac{1 + w}{1 + p}\right]^n$$

$$1 + u = \frac{1 + w}{1 + p}$$

or, solving for u

$$u = \frac{w - p}{1 + p}$$

Thus the growth rate in unit labour cost is inversely related to the labour productivity growth rate. The last equation can be expressed as

$$p = \frac{w - u}{1 + u}$$

If unit labour cost grows more quickly than average labour compensation, the labour productivity growth rate is negative.

APPENDIX 6

Labour Productivity, Unit Labour Cost and Related Data in CANSIM

	CANSIM Matrices
Labour Productivity	
Indices since 1946	
Persons at work	7922
Paid workers	7923
Person-hours worked of persons at work	7924
Person-hours worked of paid workers	7925
Real GDP per person at work	7926
Real GDP per person-hour worked of persons at work	7927
Labour compensation of persons at work	7934
Labour compensation per person at work	7935
Labour compensation per person-hour worked of persons at work	7936
Unit labour cost	7937
Real GDP	7938
Absolute values since 1961	
Number of persons at work	7916
Number of paid workers	7917
Number of person-hours worked of persons at work	7918
Number of person-hours worked of paid workers	7919
Real GDP per person at work	7920
Real GDP per person-hour worked of persons at work	7921
Average hours worked per week of persons at work	7928
Average hours worked per week of paid workers	7929
Labour compensation of persons at work	7930
Labour compensation per person at work	7931
Labour compensation per person-hour worked of persons at work	7932
Unit labour cost	7933

PART 2

Multifactor Productivity

Experimental Data

Table 1 - Indices of multifactor productivity, business sector, (1986=100)

Year	Industry measures		Interindustry measures	
	Value-added			
	Persons at work	Person-hours	Persons at work	Person-hours
1961	75.8	71.0	79.1	74.9
1962	79.1	73.8	82.0	77.5
1963	81.4	76.2	84.0	79.6
1964	83.8	78.5	86.1	81.6
1965	85.2	80.0	87.4	83.0
1966	86.2	81.4	88.3	84.2
1967	84.2	79.8	86.5	82.8
1968	86.8	82.6	88.8	85.3
1969	88.5	84.8	90.2	87.1
1970	88.5	85.2	90.2	87.5
1971	91.5	88.5	92.8	90.3
1972	94.0	91.1	94.9	92.5
1973	97.1	94.1	97.6	95.1
1974	94.5	91.8	95.3	93.2
1975	92.4	90.4	93.7	92.0
1976	95.7	93.9	96.4	94.9
1977	95.9	94.8	96.5	95.7
1978	96.0	94.5	96.7	95.5
1979	96.3	95.2	96.9	96.0
1980	95.2	94.2	96.0	95.2
1981	95.3	94.9	96.0	95.7
1982	90.3	91.0	92.1	92.6
1983	93.7	94.5	94.9	95.5
1984	98.0	98.3	98.4	98.6
1985	99.0	99.1	99.2	99.3
1986	100.0	100.0	100.0	100.0
1987	101.3	100.8	101.1	100.6
1988	101.5	100.7	101.2	100.6
1989	100.2	99.9	100.2	99.9
1990	97.6	97.1	98.0	97.6
1991	96.0	96.1	96.7	96.8

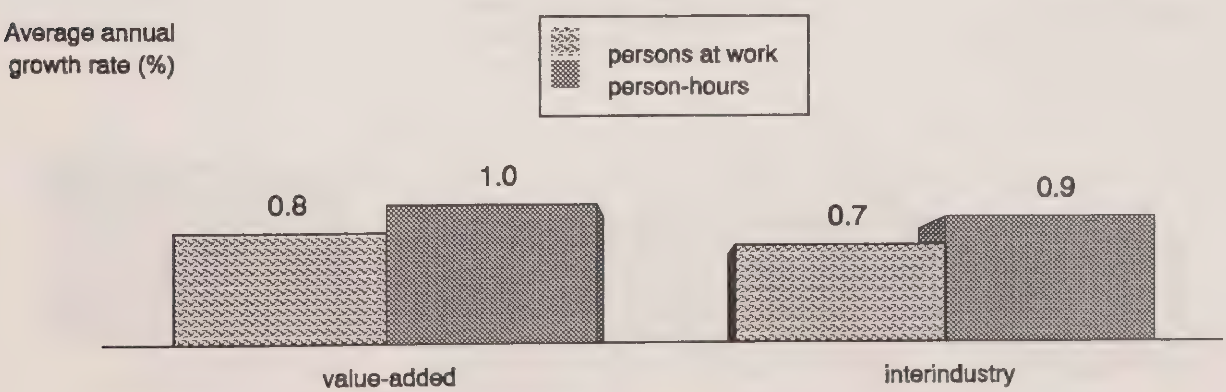


Table 2 - Indices of multifactor productivity, agricultural & related services industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	72.2	69.1	70.0	66.8	63.0	59.3
1962	83.4	80.1	81.3	77.7	73.7	69.6
1963	90.1	86.8	88.0	84.5	80.5	76.3
1964	85.0	82.3	82.9	79.9	76.9	73.2
1965	87.5	85.0	85.4	82.7	79.6	76.1
1966	94.3	91.2	92.2	88.9	86.6	82.6
1967	82.5	80.1	80.3	77.7	74.9	71.7
1968	85.2	83.2	83.0	80.8	78.4	75.6
1969	88.9	86.6	86.8	84.3	82.3	79.3
1970	84.3	82.4	82.1	80.0	77.9	75.4
1971	92.9	90.7	90.9	88.5	87.1	84.3
1972	87.3	85.6	85.1	83.3	82.3	80.0
1973	91.1	88.7	89.0	86.4	86.1	83.0
1974	81.6	79.4	79.4	77.0	77.5	74.7
1975	87.5	85.1	85.3	82.8	83.0	80.1
1976	92.5	90.2	90.4	87.9	88.3	85.6
1977	90.3	88.8	88.2	86.5	85.8	84.1
1978	88.2	87.1	86.0	84.8	83.5	82.1
1979	84.2	83.0	82.0	80.6	79.7	78.2
1980	86.3	85.7	84.1	83.4	81.4	80.6
1981	90.9	90.3	88.8	88.1	85.8	85.2
1982	93.6	93.0	92.1	91.4	87.6	87.0
1983	92.7	92.8	91.0	91.2	88.4	88.7
1984	93.1	93.2	91.5	91.7	90.3	90.6
1985	92.1	91.8	90.3	89.9	89.8	89.4
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	98.5	98.5	98.1	98.2	98.9	98.9
1988	98.3	98.9	97.9	98.7	99.2	99.8
1989	104.0	104.4	104.9	105.4	105.9	106.3

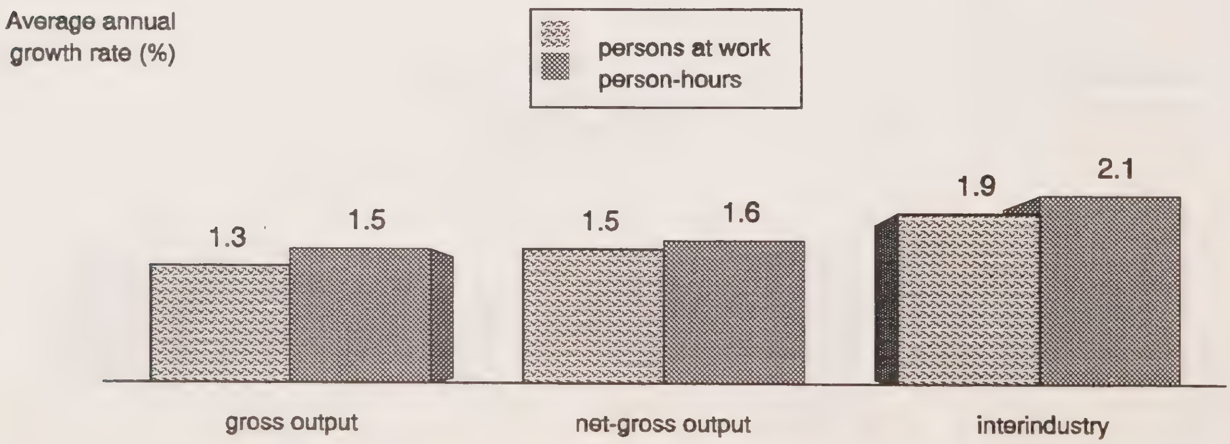


Table 3 - Indices of multifactor productivity, manufacturing industries, (1986=100)

Year	Industry measures						Interindustry measures	
	Gross output		Net-gross output		Value-added			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	81.4	80.5	76.1	75.0	56.1	54.5	71.1	68.8
1962	84.0	83.0	79.4	78.1	61.2	59.0	75.4	72.6
1963	85.4	84.3	81.1	79.7	63.8	61.4	78.0	75.4
1964	87.0	85.8	83.2	81.7	67.2	64.6	80.2	77.4
1965	88.2	87.0	84.8	83.3	69.7	67.0	82.0	79.2
1966	88.2	87.2	84.8	83.4	69.7	67.3	82.7	80.2
1967	87.4	86.4	83.7	82.5	67.9	65.8	80.9	78.7
1968	88.9	87.9	85.7	84.4	71.2	68.9	83.3	81.1
1969	90.4	89.4	87.6	86.4	74.4	72.2	86.2	84.1
1970	89.4	88.6	86.3	85.3	72.2	70.4	84.9	83.1
1971	90.8	90.1	88.1	87.2	75.4	73.7	87.6	86.1
1972	92.7	92.0	90.5	89.7	79.7	78.0	90.4	88.9
1973	94.8	94.2	93.3	92.6	84.9	83.4	94.8	93.2
1974	94.8	94.3	93.2	92.7	84.7	83.5	93.1	91.8
1975	92.5	92.3	90.3	90.1	78.8	78.5	89.6	88.9
1976	94.5	94.4	92.9	92.7	84.1	83.7	93.1	92.4
1977	96.2	96.0	95.1	94.8	88.6	88.0	94.7	94.0
1978	96.9	96.6	96.0	95.6	90.6	89.7	95.4	94.6
1979	96.9	96.8	96.0	95.9	90.5	90.2	95.6	95.2
1980	95.7	95.7	94.5	94.4	87.2	87.1	93.3	93.1
1981	96.6	96.8	95.6	95.9	89.8	90.5	93.5	93.7
1982	94.0	94.5	92.3	92.8	82.3	83.4	89.4	90.0
1983	96.7	96.8	95.7	95.9	89.9	90.3	93.3	93.7
1984	99.6	99.5	99.5	99.4	98.7	98.6	98.5	98.6
1985	100.6	100.6	100.8	100.7	101.8	101.7	100.1	100.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.3	100.2	100.4	100.2	101.0	100.5	101.0	100.7
1988	100.2	100.0	100.3	100.1	100.7	100.1	101.5	101.1
1989	99.4	99.3	99.2	99.1	98.1	98.0	100.3	100.2
1990	..	..	..	..	93.0	93.6	..	..
1991	..	..	..	..	89.9	90.6	..	..

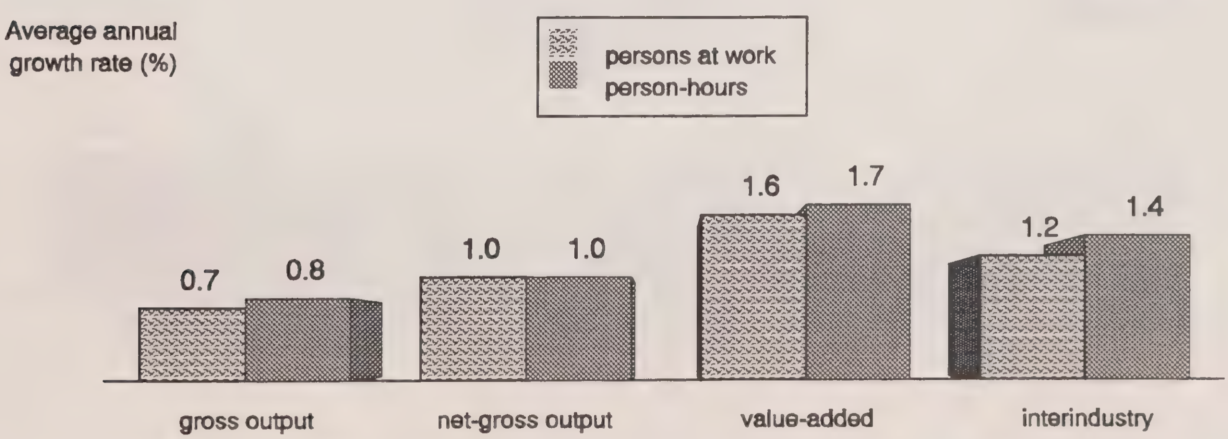


Table 4 - Indices of multifactor productivity, construction industries, (1986=100)

Year	Industry measures: Gross output: Persons at work	Industry measures: Gross output: Person-hours	Industry measures: Net-gross output: Persons at work	Industry measures: Net-gross output: Person-hours	Interindustry measures: Persons at work	Interindustry measures: Person-hours
1961	90.1	87.8	90.1	87.7	77.0	73.5
1962	91.6	88.5	91.6	88.5	80.5	76.1
1963	91.6	88.5	91.6	88.5	81.7	77.4
1964	92.0	88.8	92.0	88.7	84.5	79.8
1965	91.7	88.5	91.7	88.5	85.2	80.5
1966	90.7	87.6	90.7	87.5	84.8	80.3
1967	91.6	88.8	91.6	88.8	84.2	80.3
1968	93.3	90.8	93.3	90.8	87.4	83.8
1969	92.1	90.2	92.1	90.2	87.1	84.2
1970	92.7	90.9	92.7	90.9	87.5	84.9
1971	93.4	92.1	93.4	92.1	89.6	87.4
1972	92.8	91.4	92.8	91.3	90.6	88.4
1973	91.9	90.4	91.9	90.4	90.9	88.6
1974	90.9	89.4	90.9	89.4	88.9	86.8
1975	94.8	93.4	94.8	93.4	90.7	89.0
1976	97.5	96.4	97.5	96.4	94.4	92.9
1977	98.3	98.2	98.3	98.2	95.2	95.0
1978	96.9	96.3	96.9	96.3	94.4	93.6
1979	95.5	94.8	95.5	94.8	93.6	92.7
1980	97.8	96.9	97.8	96.9	95.4	94.4
1981	101.4	100.8	101.4	100.8	98.5	98.0
1982	103.3	104.6	103.3	104.6	96.9	98.4
1983	103.4	104.2	103.4	104.2	99.2	100.2
1984	101.2	101.5	101.2	101.5	99.9	100.2
1985	99.2	98.9	99.2	98.9	99.3	99.0
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.3	99.1	100.3	99.1	101.1	99.8
1988	99.2	97.7	99.2	97.7	100.5	98.7
1989	98.7	97.4	98.7	97.4	99.1	97.7

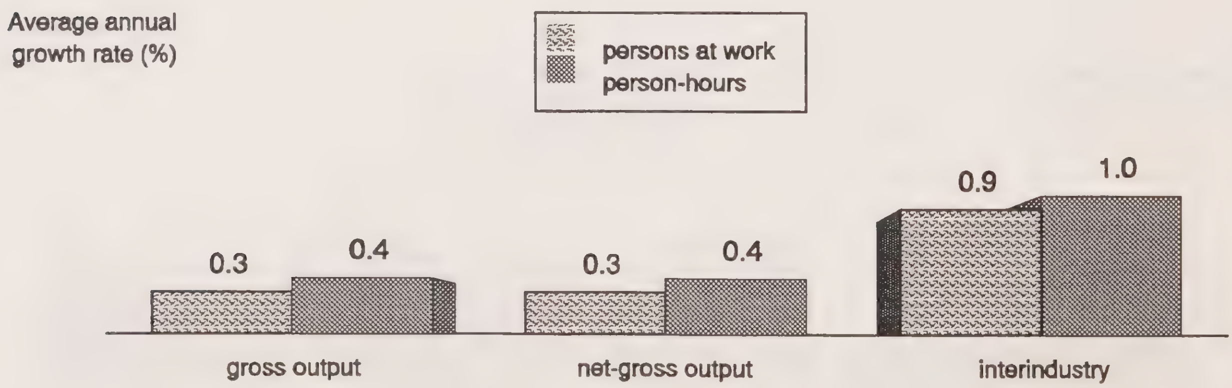


Table 5 - Indices of multifactor productivity, transportation & storage industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	68.2	65.1	65.5	62.2	65.8	61.6
1962	68.2	65.3	65.6	62.4	66.3	62.3
1963	72.3	69.2	69.9	66.6	70.7	66.4
1964	76.2	72.9	74.0	70.4	75.4	70.8
1965	77.0	73.9	74.8	71.5	76.4	72.0
1966	79.2	77.0	77.1	74.8	78.9	75.5
1967	79.0	76.5	76.9	74.3	78.1	74.5
1968	80.8	78.7	78.8	76.5	80.6	77.3
1969	84.4	82.5	82.7	80.6	84.6	81.5
1970	87.5	85.8	86.1	84.2	88.1	85.4
1971	88.0	86.5	86.7	85.0	89.1	86.6
1972	90.1	89.0	89.0	87.7	92.2	90.2
1973	91.5	90.3	90.5	89.1	94.6	92.5
1974	90.5	89.4	89.4	88.2	92.9	91.0
1975	89.6	89.0	88.4	87.8	90.9	89.7
1976	89.6	89.2	88.4	87.9	91.1	90.0
1977	90.2	90.1	89.1	88.9	91.7	91.2
1978	92.4	91.9	91.5	91.0	93.7	92.7
1979	96.8	96.5	96.4	96.1	98.5	97.9
1980	93.3	92.8	92.5	92.0	94.2	93.3
1981	92.4	92.7	91.5	91.7	92.8	92.9
1982	90.8	91.4	89.7	90.3	89.7	90.3
1983	95.2	96.3	94.6	95.9	95.2	96.6
1984	99.1	99.6	98.9	99.5	99.2	99.9
1985	99.4	99.7	99.3	99.7	99.7	100.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.1	102.2	103.6	102.5	103.7	102.5
1988	106.3	105.2	107.2	106.0	107.2	105.9
1989	104.3	103.6	104.9	104.1	104.5	103.8

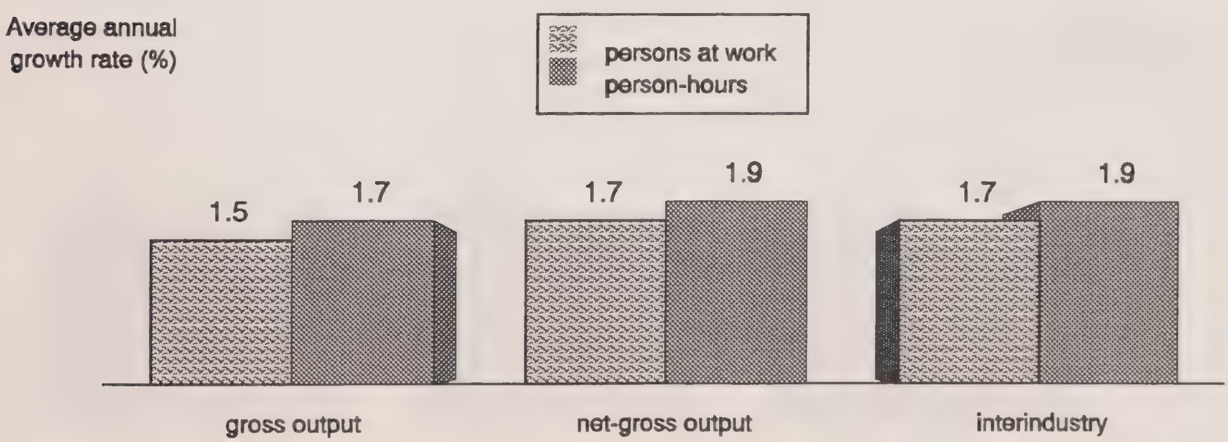


Table 6 - Indices of multifactor productivity, telecommunication industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	38.4	37.0	37.4	36.0	36.8	35.1
1962	39.5	38.2	38.5	37.1	38.1	36.4
1963	40.4	39.0	39.4	38.0	39.0	37.3
1964	41.8	40.3	40.8	39.3	40.6	38.8
1965	44.4	42.9	43.4	41.9	43.3	41.5
1966	44.9	43.9	43.9	42.9	43.8	42.5
1967	46.8	45.7	45.8	44.6	45.6	44.1
1968	49.5	48.6	48.5	47.6	48.4	47.1
1969	52.3	51.3	51.3	50.3	51.2	50.0
1970	55.0	54.2	54.0	53.2	54.0	52.9
1971	56.1	55.5	55.2	54.5	55.3	54.4
1972	58.7	58.2	57.8	57.3	58.2	57.4
1973	61.5	60.9	60.6	60.0	61.2	60.4
1974	64.8	64.3	63.9	63.4	64.4	63.6
1975	69.3	69.2	68.6	68.5	68.9	68.5
1976	71.3	71.2	70.6	70.5	71.1	70.8
1977	72.4	72.6	71.7	71.9	72.1	72.2
1978	76.4	76.2	75.8	75.6	76.3	75.9
1979	81.0	81.0	80.5	80.5	81.1	80.8
1980	86.9	86.7	86.6	86.3	87.2	86.8
1981	89.3	89.6	89.0	89.3	89.6	89.8
1982	86.2	86.8	85.8	86.4	85.6	86.2
1983	88.1	89.1	87.7	88.7	87.5	88.6
1984	92.8	93.2	92.6	93.0	92.8	93.2
1985	96.1	96.4	96.0	96.3	96.0	96.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.0	104.2	104.1	104.4	104.1	104.3
1988	106.0	106.1	106.2	106.3	106.0	106.0
1989	112.4	112.7	112.8	113.1	112.2	112.4

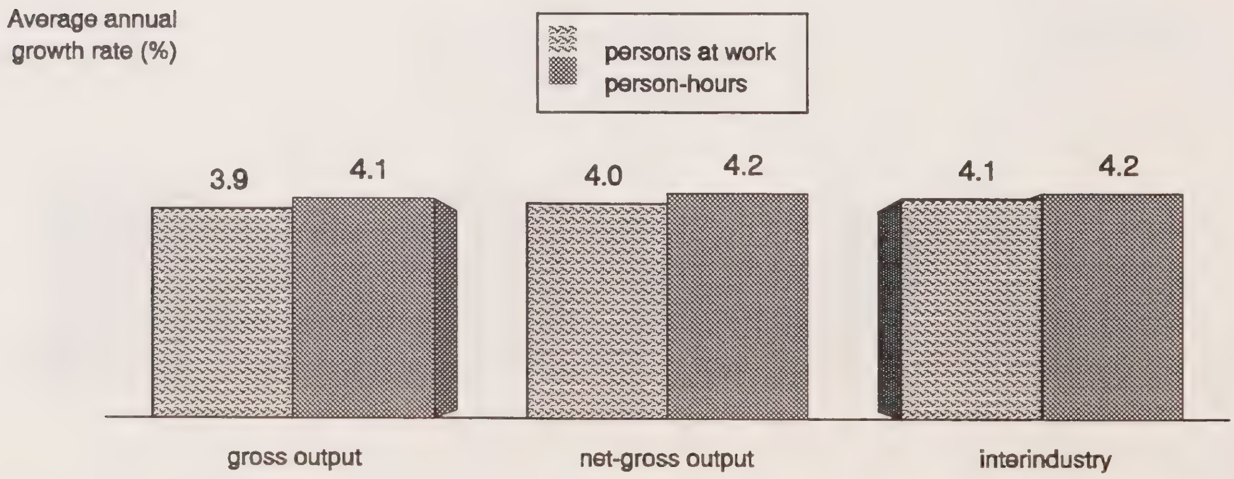


Table 7 - Indices of multifactor productivity, wholesale trade industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	70.1	67.4	69.7	66.9	66.6	63.1
1962	72.5	69.6	72.0	69.1	69.0	65.3
1963	73.4	70.8	73.0	70.3	70.3	66.9
1964	76.2	73.5	75.8	73.1	73.7	70.1
1965	76.5	74.1	76.2	73.7	74.3	71.0
1966	79.4	77.3	79.1	76.9	77.4	74.5
1967	81.4	78.8	81.1	78.5	78.9	75.6
1968	81.7	79.7	81.4	79.4	79.7	77.0
1969	82.9	81.4	82.6	81.1	81.3	79.1
1970	85.2	83.8	84.9	83.5	83.8	81.8
1971	87.3	86.4	87.1	86.2	86.2	84.7
1972	89.2	88.0	89.0	87.8	88.8	87.0
1973	90.3	88.0	90.2	87.9	90.5	87.7
1974	89.3	88.2	89.1	88.0	89.2	87.6
1975	89.1	88.6	89.0	88.4	88.4	87.5
1976	90.9	90.4	90.8	90.2	90.5	89.6
1977	86.8	87.0	86.6	86.8	86.4	86.4
1978	85.4	85.0	85.2	84.8	85.1	84.4
1979	88.4	88.6	88.2	88.4	88.4	88.3
1980	92.5	92.4	92.4	92.3	92.2	91.9
1981	92.9	93.0	92.8	92.9	92.4	92.4
1982	89.2	89.8	89.0	89.6	87.4	88.0
1983	91.9	93.0	91.7	92.9	90.5	91.8
1984	92.9	94.0	92.8	93.9	92.6	93.7
1985	96.4	97.3	96.4	97.3	96.2	97.1
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.6	101.6	101.6	101.7	101.9	101.9
1988	103.8	103.9	103.9	103.9	104.2	104.1
1989	103.3	104.0	103.4	104.1	103.3	104.0

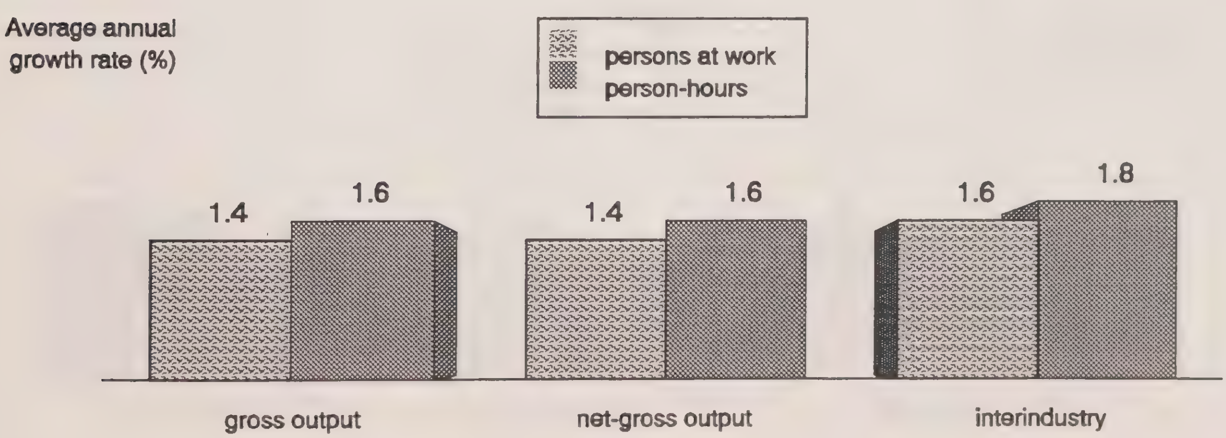


Table 8 - Indices of multifactor productivity, retail trade industries, (1986=100)

Year	Industry measures: Gross output: Persons at work	Industry measures: Gross output: Person-hours	Industry measures: Net-gross output: Persons at work	Industry measures: Net-gross output: Person-hours	Interindustry measures: Persons at work	Interindustry measures: Person-hours
1961	78.1	70.0	77.9	69.8	74.7	66.2
1962	80.8	72.6	80.7	72.5	78.2	69.4
1963	82.2	74.3	82.1	74.1	80.0	71.5
1964	84.4	76.6	84.3	76.4	82.5	73.9
1965	87.0	79.0	86.9	78.9	85.4	76.7
1966	89.2	81.4	89.1	81.3	88.0	79.6
1967	90.6	83.0	90.5	82.9	88.4	80.2
1968	91.0	84.2	91.0	84.1	89.5	82.1
1969	91.5	85.2	91.4	85.2	90.3	83.4
1970	92.4	86.9	92.4	86.8	91.3	85.2
1971	93.7	88.5	93.6	88.4	93.1	87.4
1972	96.3	91.5	96.3	91.4	96.3	90.9
1973	96.5	92.1	96.5	92.1	97.0	92.1
1974	94.8	90.8	94.8	90.7	94.7	90.2
1975	95.8	92.2	95.8	92.1	95.2	91.2
1976	99.0	96.2	99.0	96.2	99.0	95.7
1977	98.8	96.6	98.8	96.5	98.6	96.1
1978	97.6	95.8	97.6	95.8	97.5	95.4
1979	96.5	94.8	96.5	94.8	96.5	94.5
1980	94.3	93.0	94.3	93.0	94.1	92.5
1981	92.8	91.9	92.8	91.8	92.5	91.4
1982	91.9	92.2	91.8	92.1	90.2	90.5
1983	98.0	99.2	98.0	99.2	96.6	97.9
1984	98.8	99.3	98.8	99.3	98.3	98.9
1985	99.7	100.0	99.7	100.0	99.4	99.7
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.1	103.3	103.1	103.4	103.2	103.4
1988	103.1	103.6	103.1	103.6	103.1	103.4
1989	102.3	103.0	102.3	103.0	101.9	102.6

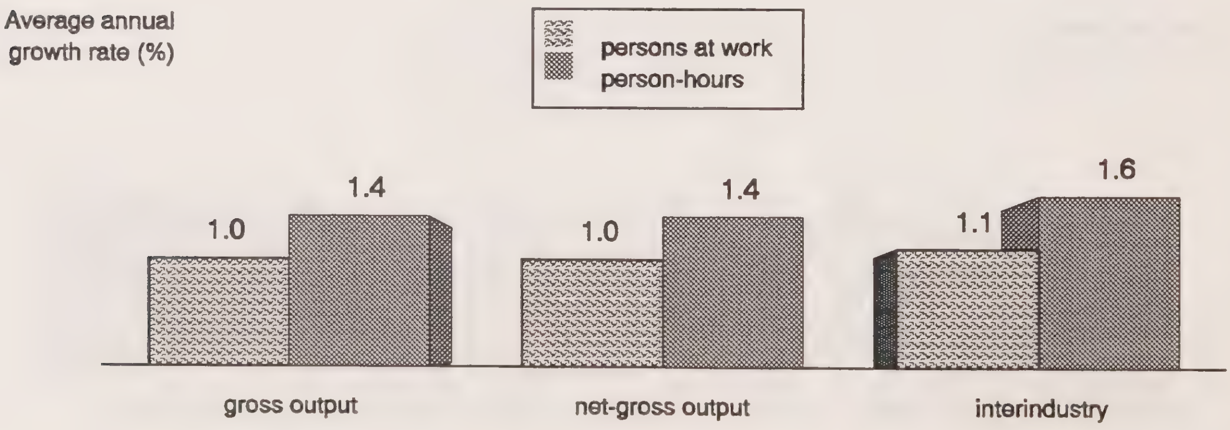


Table 9 - Indices of multifactor productivity, food industries, (1986=100)

Year	Industry measures: Gross output, Persons at work	Industry measures: Gross output, Person-hours	Industry measures: Net-gross output, Persons at work	Industry measures: Net-gross output, Person-hours	Interindustry measures: Persons at work	Interindustry measures: Person-hours
1961	91.4	90.2	90.1	88.6	72.6	68.8
1962	92.6	91.3	91.5	90.0	78.8	74.7
1963	92.5	91.3	91.3	89.9	81.6	77.6
1964	93.3	92.0	92.2	90.7	81.4	77.5
1965	94.2	93.0	93.2	91.8	83.7	80.0
1966	93.6	92.5	92.5	91.3	85.8	82.2
1967	94.5	93.4	93.6	92.3	81.9	78.5
1968	94.8	93.5	93.9	92.4	83.9	80.6
1969	94.7	93.6	93.8	92.6	85.8	82.7
1970	95.0	94.0	94.1	93.0	85.0	82.2
1971	97.2	96.3	96.7	95.7	91.2	88.4
1972	97.3	96.7	96.8	96.1	90.2	87.9
1973	98.2	97.7	97.9	97.3	94.2	91.6
1974	98.0	97.5	97.7	97.1	88.7	86.4
1975	96.5	95.9	95.8	95.1	88.0	85.7
1976	99.1	98.6	99.0	98.3	94.0	91.7
1977	100.0	99.7	100.1	99.6	94.4	92.7
1978	100.0	99.7	100.0	99.6	93.7	92.1
1979	100.0	99.8	100.1	99.8	91.9	90.5
1980	98.8	98.8	98.6	98.5	90.5	89.8
1981	98.4	98.5	98.1	98.2	92.0	91.6
1982	98.7	98.9	98.5	98.6	92.1	92.0
1983	98.4	98.2	98.1	97.9	92.9	92.8
1984	99.3	99.0	99.2	98.8	95.5	95.3
1985	100.5	100.4	100.6	100.5	97.1	97.0
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.8	99.7	99.8	99.6	99.6	99.4
1988	98.0	97.7	97.7	97.4	97.5	97.3
1989	96.7	96.7	96.2	96.1	97.8	97.8

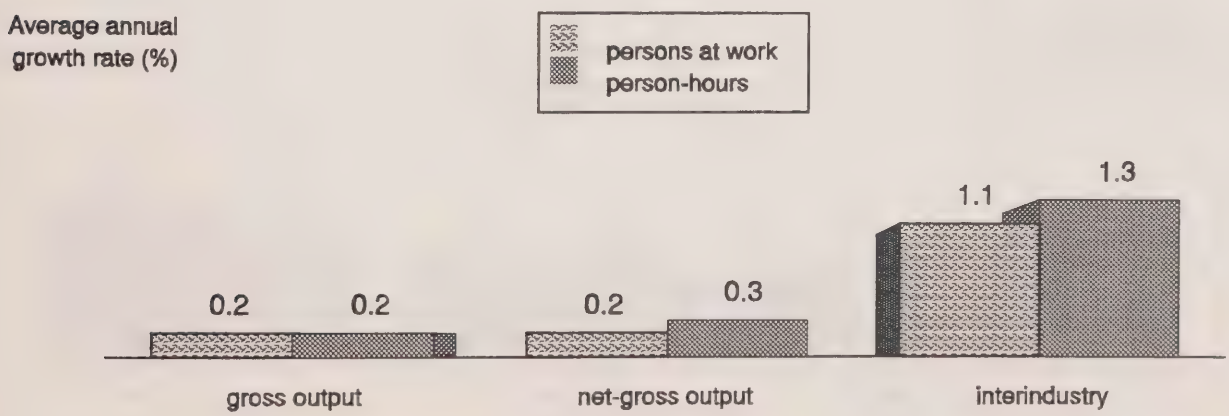


Table 10 - Indices of multifactor productivity, beverage industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	87.1	85.8	86.7	85.4	78.5	75.5
1962	88.9	87.5	88.6	87.1	81.3	78.0
1963	92.8	91.4	92.7	91.2	85.6	82.4
1964	94.2	92.7	94.1	92.5	87.9	84.4
1965	96.2	94.6	96.1	94.5	90.4	86.9
1966	102.2	100.7	102.5	100.8	96.9	93.4
1967	104.3	102.6	104.6	102.9	97.8	94.3
1968	101.1	99.3	101.3	99.3	95.6	92.1
1969	103.6	102.1	103.9	102.3	99.0	95.8
1970	104.9	103.4	105.2	103.7	100.3	97.4
1971	105.5	104.2	105.9	104.5	102.0	99.3
1972	106.1	105.0	106.5	105.4	104.1	101.7
1973	110.6	109.6	111.2	110.2	110.6	108.2
1974	108.8	107.8	109.3	108.3	107.4	105.2
1975	106.3	105.3	106.7	105.6	103.2	101.2
1976	106.0	105.0	106.4	105.4	105.1	103.2
1977	108.8	108.0	109.3	108.5	107.9	106.3
1978	108.0	107.3	108.5	107.7	107.9	106.4
1979	108.4	107.8	108.9	108.2	108.2	106.8
1980	107.8	107.5	108.3	108.0	106.8	105.8
1981	107.2	107.2	107.7	107.6	106.5	106.1
1982	104.2	104.3	104.5	104.6	101.1	101.1
1983	103.6	103.5	103.8	103.8	102.1	102.0
1984	103.8	104.4	104.1	104.7	104.3	104.8
1985	102.3	102.2	102.4	102.3	102.9	102.7
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.5	101.3	101.7	101.3	102.0	101.5
1988	103.3	102.6	103.5	102.8	104.0	103.0
1989	104.5	104.8	104.8	105.1	104.9	105.0

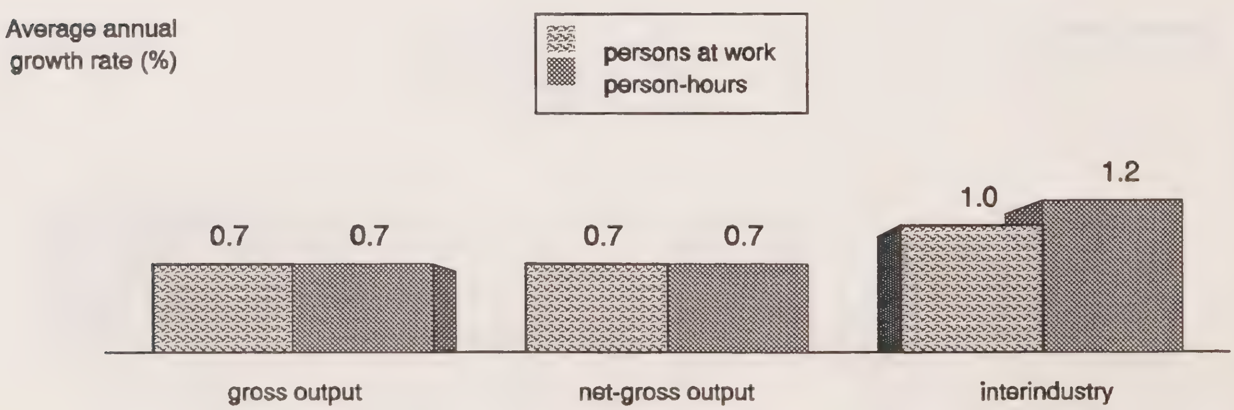


Table 11 - Indices of multifactor productivity, tobacco products industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	93.9	90.9	92.1	88.6	76.3	71.2
1962	92.6	90.0	90.6	87.5	79.6	74.6
1963	95.3	92.9	93.8	91.0	85.1	80.4
1964	96.9	94.8	95.8	93.3	86.7	82.2
1965	99.2	96.5	98.5	95.3	90.2	85.1
1966	96.2	93.4	94.8	91.5	89.5	84.3
1967	94.1	91.5	92.3	89.3	82.4	78.0
1968	93.2	90.9	91.2	88.5	83.2	79.3
1969	96.7	94.7	95.5	93.1	89.2	85.4
1970	98.4	96.2	97.6	95.0	89.8	86.0
1971	102.4	100.4	102.4	100.1	98.0	94.3
1972	104.8	102.9	105.3	103.1	100.2	96.8
1973	106.2	104.6	107.0	105.1	103.8	100.4
1974	109.0	107.6	110.5	108.8	103.7	100.7
1975	107.6	106.0	108.8	106.9	102.9	100.0
1976	106.5	104.9	107.5	105.6	104.3	101.4
1977	114.0	112.8	116.7	115.2	112.6	110.4
1978	108.7	107.4	110.2	108.7	106.2	103.9
1979	109.6	108.2	111.2	109.7	106.4	104.1
1980	110.3	109.3	112.1	111.0	107.6	105.8
1981	109.8	108.6	111.6	110.2	108.4	106.6
1982	109.5	108.7	111.2	110.3	106.5	105.5
1983	106.5	105.7	107.7	106.7	104.7	104.0
1984	105.2	104.5	106.1	105.3	104.7	104.0
1985	100.5	99.5	100.6	99.4	99.3	98.1
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.7	105.2	106.5	106.0	106.6	105.9
1988	110.1	109.5	111.5	110.8	111.5	110.8
1989	108.9	108.6	110.1	109.7	110.6	110.1

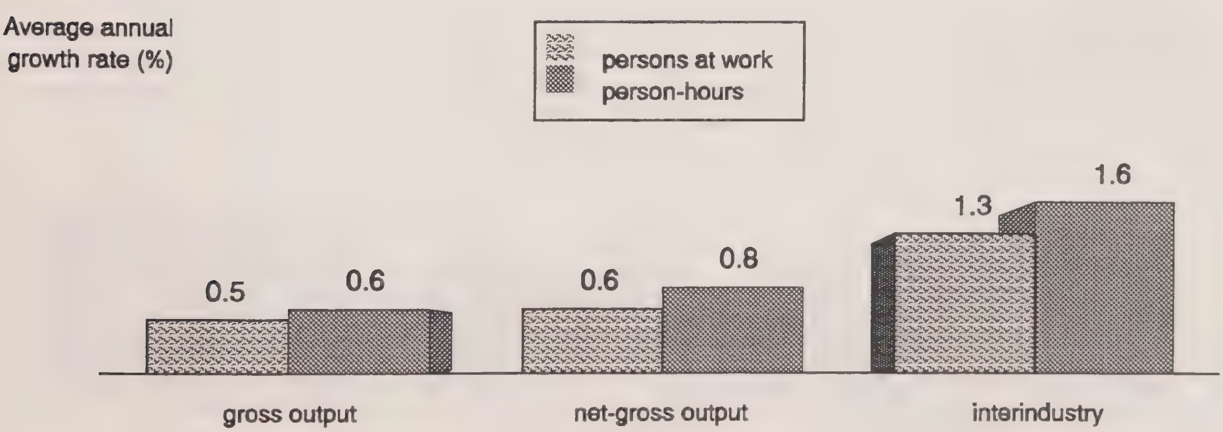


Table 12 - Indices of multifactor productivity, plastic products industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	66.1	65.8	65.2	64.9	56.6	55.7
1962	66.9	66.2	66.0	65.3	58.9	57.5
1963	69.5	68.9	68.7	68.0	62.2	61.0
1964	72.6	71.4	71.8	70.6	67.0	65.1
1965	73.7	72.9	73.0	72.2	68.2	66.6
1966	75.0	74.0	74.4	73.4	69.7	68.1
1967	74.5	73.4	73.8	72.7	68.7	66.8
1968	84.8	83.5	84.3	83.1	79.3	77.3
1969	88.2	87.2	87.9	86.8	83.6	81.7
1970	85.8	85.0	85.4	84.6	81.2	79.9
1971	88.3	87.7	88.0	87.3	84.5	83.2
1972	93.2	92.6	93.0	92.3	90.9	89.7
1973	94.9	94.5	94.8	94.3	94.9	94.0
1974	90.2	90.3	89.8	89.9	89.3	88.9
1975	86.1	86.3	85.7	85.9	82.4	82.4
1976	87.1	87.1	86.6	86.6	84.3	84.3
1977	88.7	88.8	88.3	88.4	85.4	85.5
1978	92.2	92.3	91.9	92.0	89.8	89.8
1979	96.1	95.6	95.9	95.4	95.9	95.4
1980	93.9	93.9	93.6	93.7	91.8	92.0
1981	97.8	97.7	97.7	97.6	96.1	96.2
1982	96.6	96.6	96.4	96.4	91.2	91.7
1983	101.0	100.7	101.0	100.7	98.3	98.5
1984	103.2	103.2	103.4	103.3	103.1	103.2
1985	103.7	103.4	103.9	103.6	103.4	103.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.3	99.2	99.3	99.1	100.6	100.4
1988	96.5	96.3	96.4	96.1	98.9	98.7
1989	94.8	94.2	94.5	94.0	96.8	96.4

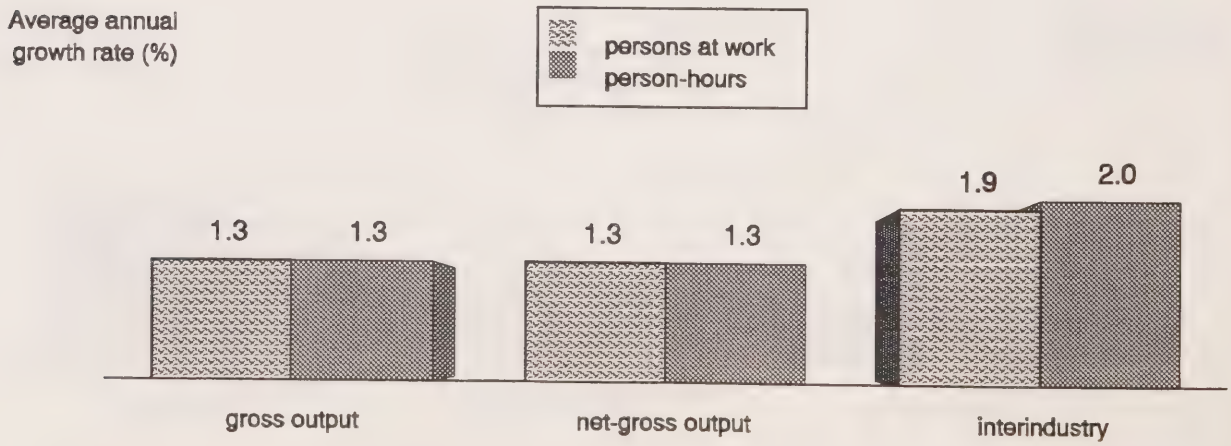


Table 13 - Indices of multifactor productivity, rubber, leather & allied products industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	75.3	74.2	73.6	72.5	65.5	63.5
1962	80.6	78.9	79.3	77.5	71.8	69.1
1963	81.2	79.6	80.0	78.4	73.3	70.7
1964	83.2	81.4	82.2	80.3	76.4	73.5
1965	83.1	81.6	82.1	80.5	76.6	74.1
1966	84.4	82.9	83.5	81.9	78.1	75.7
1967	84.0	82.4	83.0	81.4	77.3	74.8
1968	84.6	82.8	83.7	81.8	78.8	76.2
1969	85.3	83.7	84.4	82.8	80.2	77.9
1970	84.1	82.8	83.2	81.7	79.2	77.2
1971	85.0	83.7	84.1	82.7	81.0	79.1
1972	84.5	83.2	83.6	82.2	81.7	79.8
1973	86.8	85.7	86.0	84.9	85.0	83.4
1974	84.5	83.6	83.6	82.6	82.3	80.8
1975	82.5	82.1	81.5	81.0	78.8	78.1
1976	88.5	87.7	87.8	87.0	85.6	84.7
1977	93.3	92.6	92.9	92.1	90.6	89.7
1978	96.2	95.5	96.0	95.3	94.2	93.4
1979	98.2	97.1	98.2	96.9	97.5	96.2
1980	95.4	94.8	95.1	94.5	93.3	92.7
1981	94.9	94.2	94.6	93.9	93.2	92.6
1982	92.4	91.7	91.9	91.2	88.2	87.8
1983	96.2	95.9	96.0	95.6	93.6	93.5
1984	103.2	102.7	103.4	102.9	102.6	102.3
1985	104.1	103.6	104.4	103.8	104.0	103.6
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.5	102.7	102.6	102.9	103.1	103.2
1988	103.5	103.3	103.7	103.4	104.6	104.2
1989	103.6	102.6	103.8	102.8	104.4	103.3

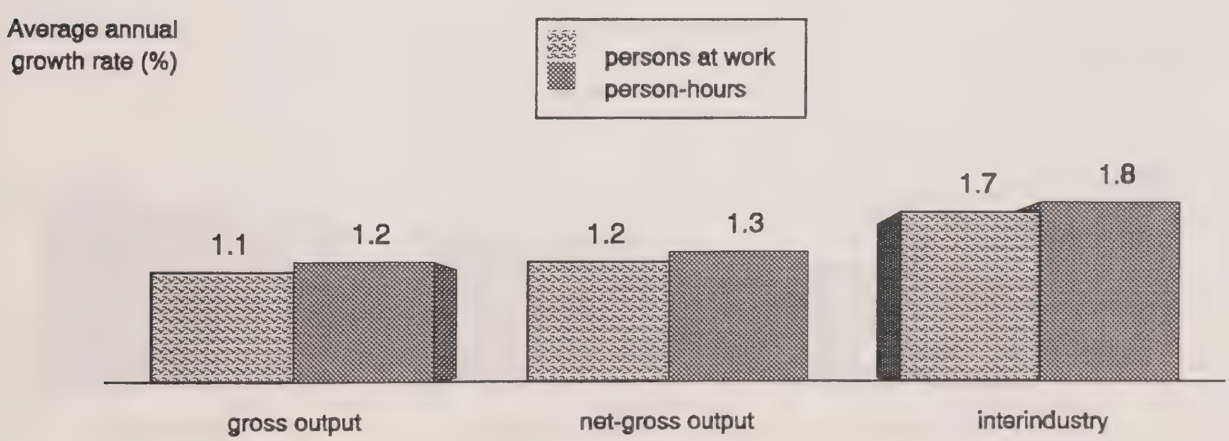


Table 14 - Indices of multifactor productivity, textile, textile products & clothing industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	69.6	68.5	62.1	60.8	60.1	58.3
1962	72.9	71.4	66.0	64.2	64.1	61.7
1963	74.9	73.1	68.4	66.3	66.7	63.9
1964	75.3	73.4	68.9	66.7	67.6	64.8
1965	74.8	73.2	68.4	66.4	67.3	64.7
1966	74.6	73.1	68.0	66.3	67.3	65.1
1967	74.0	72.5	67.4	65.5	66.5	64.1
1968	76.7	75.2	70.8	68.9	69.9	67.6
1969	78.0	76.4	72.3	70.4	71.4	69.1
1970	77.4	76.0	71.6	69.9	71.1	69.1
1971	79.5	78.5	74.2	73.0	74.0	72.4
1972	82.1	81.1	77.5	76.3	77.3	75.7
1973	83.2	82.5	78.9	78.0	79.0	77.8
1974	83.3	82.6	78.9	78.1	78.9	77.7
1975	84.2	83.6	80.1	79.3	79.7	78.7
1976	86.2	85.8	82.7	82.2	82.7	81.9
1977	88.5	88.2	85.4	85.1	85.1	84.6
1978	92.0	91.8	89.8	89.6	89.8	89.2
1979	94.2	94.0	92.7	92.4	92.8	92.3
1980	93.9	94.1	92.3	92.6	92.2	92.3
1981	95.2	95.6	94.0	94.4	93.6	93.9
1982	91.4	91.9	89.1	89.7	87.6	88.4
1983	95.0	95.0	93.7	93.6	92.1	92.2
1984	96.6	96.5	95.7	95.6	95.3	95.3
1985	97.6	97.8	96.9	97.3	96.8	97.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.9	100.1	101.1	100.2	101.6	100.5
1988	98.7	98.4	98.4	97.9	98.7	98.1
1989	98.3	97.9	97.8	97.3	98.2	97.4

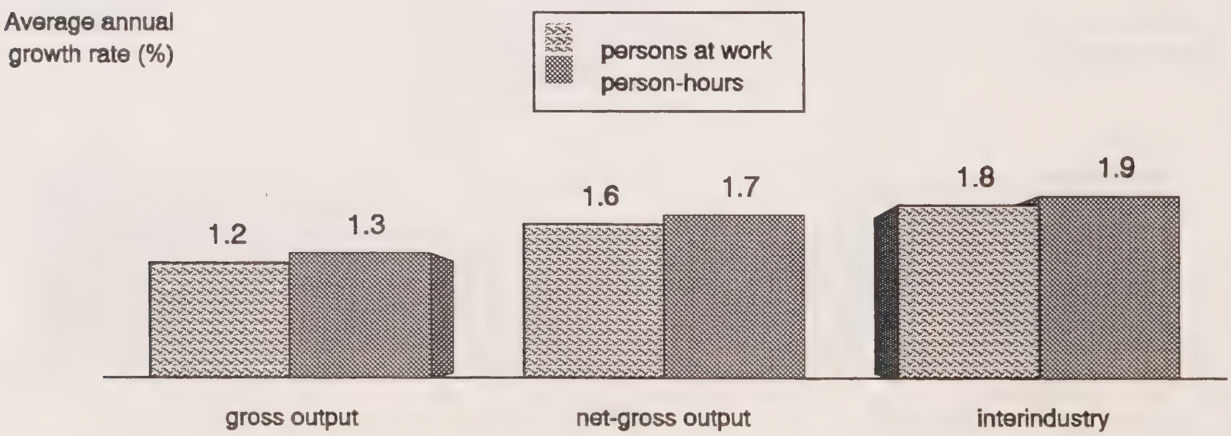


Table 15 - Indices of multifactor productivity, wood industries, (1986=100)

Year	Industry measures: Gross output: Persons at work	Industry measures: Gross output: Person-hours	Industry measures: Net-gross output: Persons at work	Industry measures: Net-gross output: Person-hours	Interindustry measures: Persons at work	Interindustry measures: Person-hours
1961	75.5	74.8	73.3	72.5	55.7	52.8
1962	78.2	76.8	76.2	74.7	59.0	55.3
1963	81.1	79.5	79.4	77.6	62.8	59.3
1964	82.3	80.5	80.7	78.7	65.1	61.0
1965	82.7	80.9	81.2	79.1	65.4	61.2
1966	82.6	81.1	81.1	79.4	65.4	61.7
1967	84.1	82.0	82.7	80.4	66.0	61.9
1968	86.6	84.9	85.4	83.5	70.2	66.4
1969	86.5	85.0	85.4	83.7	71.4	68.2
1970	86.6	85.4	85.4	84.1	72.4	69.4
1971	85.6	84.2	84.3	82.8	71.7	69.0
1972	82.9	81.9	81.3	80.3	70.8	68.7
1973	83.4	82.4	81.9	80.8	71.5	69.3
1974	83.3	82.7	81.8	81.1	71.5	69.7
1975	81.7	81.1	80.0	79.3	67.5	66.1
1976	84.9	84.1	83.6	82.6	72.5	70.7
1977	87.3	86.7	86.3	85.6	75.0	73.8
1978	86.1	85.7	84.9	84.4	74.4	73.3
1979	86.0	85.6	84.8	84.3	74.5	73.9
1980	88.8	88.6	87.9	87.6	78.1	77.7
1981	89.1	90.3	88.2	89.4	78.0	79.1
1982	87.0	89.4	85.9	88.5	75.4	77.8
1983	92.2	93.0	91.5	92.4	84.2	85.3
1984	96.6	96.9	96.3	96.6	93.2	93.5
1985	100.0	100.1	100.0	100.1	98.0	97.9
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.6	102.4	102.9	102.6	105.7	104.5
1988	101.5	100.8	101.7	100.9	106.1	104.4
1989	99.7	99.0	99.7	98.9	103.1	101.9

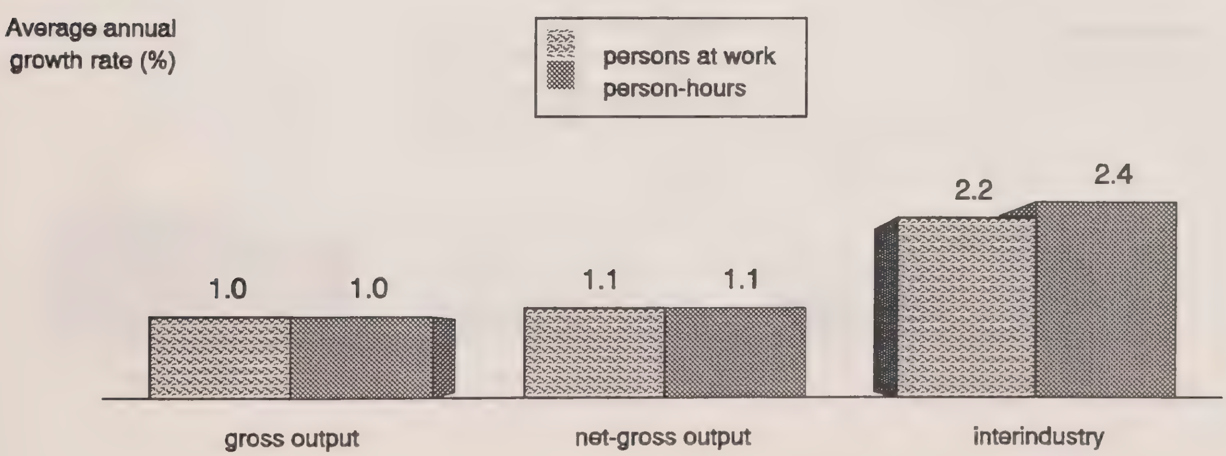


Table 16 - Indices of multifactor productivity, furniture & fixture industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	87.6	86.7	87.3	86.4	74.1	72.0
1962	89.8	88.4	89.6	88.2	77.7	74.8
1963	92.1	90.8	91.9	90.6	81.0	78.2
1964	91.9	90.5	91.7	90.3	82.4	79.4
1965	94.5	93.2	94.4	93.0	84.9	82.1
1966	95.7	94.4	95.6	94.3	86.2	83.6
1967	95.2	94.3	95.1	94.1	85.4	83.1
1968	96.4	95.7	96.4	95.6	88.1	86.1
1969	98.8	98.2	98.8	98.2	91.4	89.6
1970	96.1	95.6	96.0	95.5	89.0	87.5
1971	97.5	96.9	97.4	96.9	91.1	89.6
1972	103.8	103.3	103.9	103.4	98.5	97.0
1973	107.0	106.6	107.2	106.8	103.0	101.6
1974	97.8	97.5	97.8	97.4	93.5	92.4
1975	96.2	96.1	96.2	96.0	89.7	89.0
1976	101.5	101.1	101.6	101.2	96.2	95.2
1977	102.4	102.0	102.5	102.1	97.5	96.7
1978	106.4	106.2	106.6	106.4	102.2	101.4
1979	104.2	103.7	104.4	103.8	100.8	99.8
1980	102.3	102.2	102.4	102.3	98.7	98.2
1981	103.4	103.4	103.6	103.5	99.8	99.7
1982	93.5	93.1	93.3	92.9	87.2	87.0
1983	98.5	99.0	98.5	99.0	94.8	95.4
1984	101.0	101.0	101.0	101.1	99.7	99.6
1985	101.8	101.9	101.9	102.0	101.6	101.7
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	95.5	95.3	95.3	95.1	96.1	95.8
1988	92.8	92.6	92.4	92.3	93.5	93.0
1989	92.2	93.4	91.8	93.1	92.2	93.4

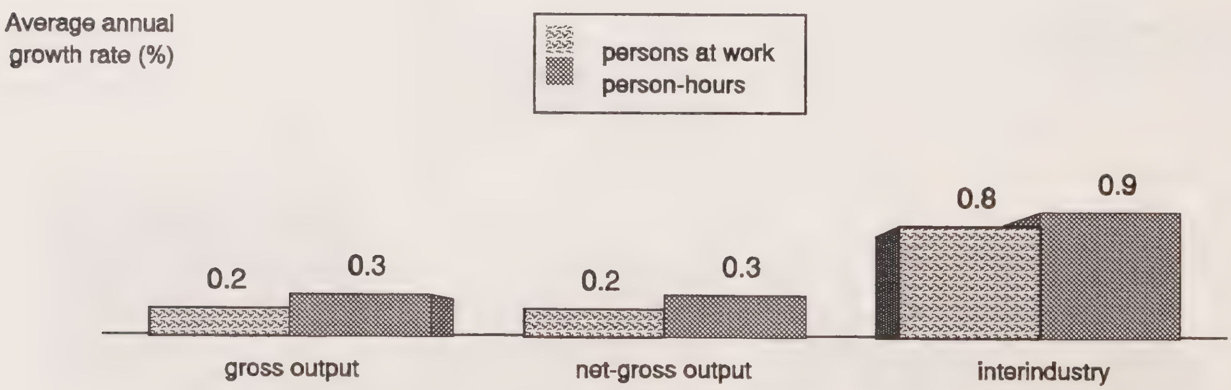


Table 17 - Indices of multifactor productivity, paper & allied products industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	96.8	95.4	96.4	94.8	83.3	79.4
1962	97.1	95.6	96.8	95.0	83.8	79.8
1963	98.2	96.7	98.0	96.4	86.1	82.5
1964	100.5	98.8	100.7	98.7	89.9	85.6
1965	99.0	97.5	98.9	97.2	87.9	84.1
1966	98.2	96.9	98.1	96.5	87.6	84.1
1967	94.4	93.3	93.7	92.4	82.3	79.4
1968	94.9	93.9	94.2	93.0	84.4	81.8
1969	97.5	96.3	97.2	95.8	88.4	85.8
1970	96.9	96.2	96.6	95.8	88.3	86.3
1971	96.4	96.1	96.0	95.6	88.2	87.0
1972	99.3	98.7	99.3	98.6	92.9	91.6
1973	101.9	101.6	102.3	102.0	96.9	95.9
1974	103.8	103.6	104.5	104.3	98.4	97.5
1975	90.8	92.9	89.7	92.0	81.2	83.5
1976	98.1	98.8	97.8	98.7	90.9	91.5
1977	98.8	98.6	98.6	98.4	91.9	91.7
1978	102.1	100.5	102.4	100.5	96.0	93.9
1979	101.5	101.5	101.7	101.7	95.8	96.1
1980	101.6	100.3	101.8	100.3	95.6	94.2
1981	99.9	100.0	99.8	100.0	93.1	93.9
1982	94.1	94.1	93.3	93.4	84.9	85.3
1983	98.4	98.4	98.2	98.1	92.5	92.7
1984	99.7	99.6	99.6	99.5	97.2	97.2
1985	99.9	99.7	99.9	99.7	98.7	98.4
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.3	101.4	101.4	101.6	103.5	103.4
1988	99.8	99.6	99.8	99.6	102.5	101.7
1989	95.6	95.4	95.0	94.8	96.7	96.0

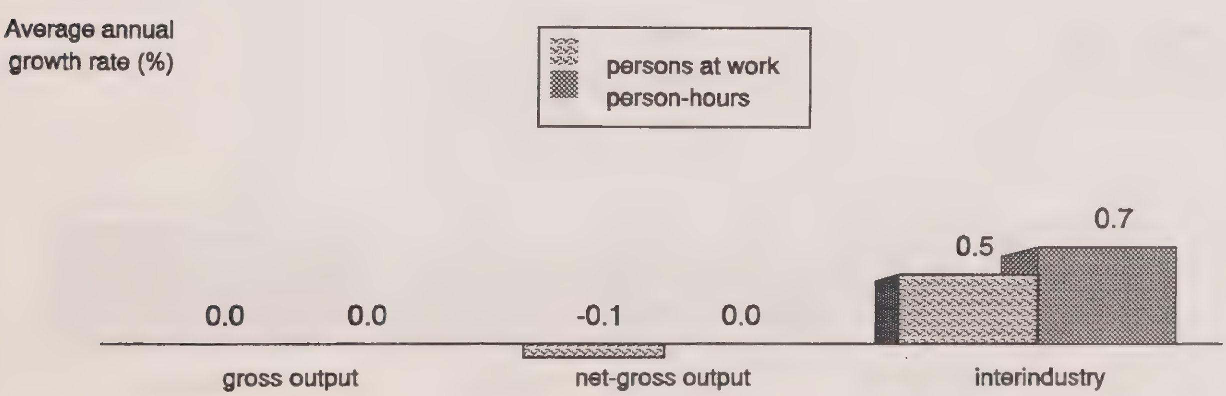


Table 18 - Indices of multifactor productivity, printing, publishing & allied industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	83.9	81.2	82.9	80.0	76.4	72.6
1962	85.4	82.5	84.5	81.4	78.1	74.1
1963	85.7	82.7	84.8	81.6	78.9	75.0
1964	85.1	82.3	84.2	81.2	79.4	75.6
1965	84.7	81.9	83.8	80.8	78.9	75.3
1966	85.3	82.7	84.4	81.6	79.6	76.2
1967	85.5	82.8	84.6	81.7	78.7	75.4
1968	86.1	83.3	85.3	82.3	80.1	76.8
1969	86.9	83.8	86.1	82.8	81.7	78.1
1970	85.9	82.9	85.0	81.8	80.9	77.6
1971	86.2	83.6	85.4	82.6	81.7	78.8
1972	88.8	86.2	88.1	85.3	85.4	82.4
1973	91.7	89.3	91.1	88.6	89.3	86.7
1974	91.1	89.1	90.5	88.4	88.7	86.5
1975	92.0	90.1	91.5	89.5	86.5	85.1
1976	96.6	94.9	96.4	94.6	93.1	91.6
1977	99.7	98.2	99.7	98.1	96.3	95.1
1978	101.9	100.2	102.1	100.2	99.8	97.7
1979	101.1	99.7	101.1	99.7	99.1	97.9
1980	101.4	99.6	101.5	99.6	99.4	97.5
1981	101.4	100.3	101.5	100.4	98.9	98.3
1982	96.8	95.7	96.6	95.4	91.9	91.3
1983	98.8	98.4	98.7	98.3	96.2	96.1
1984	101.6	101.1	101.7	101.1	100.7	100.4
1985	101.2	101.1	101.3	101.2	100.9	100.7
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	97.8	97.5	97.6	97.3	98.4	98.0
1988	97.6	96.9	97.4	96.7	98.2	97.3
1989	95.3	94.7	94.9	94.3	94.6	93.9

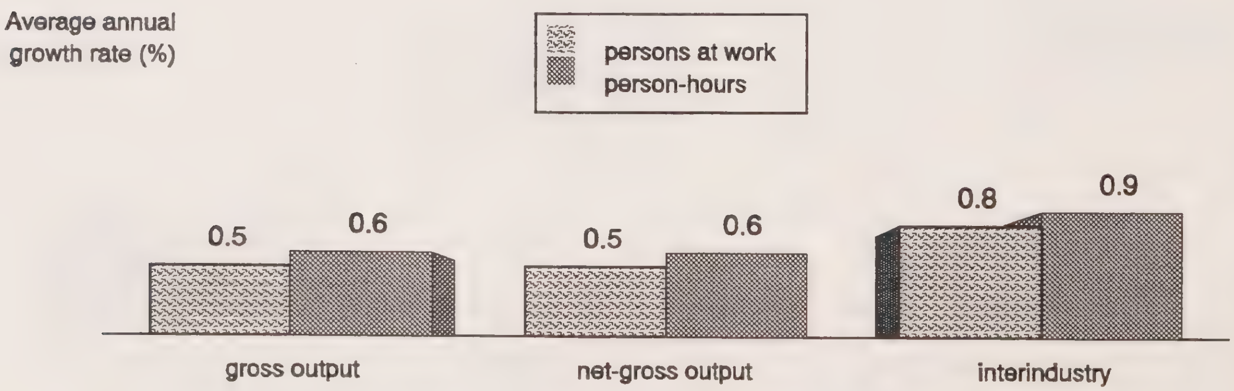


Table 19 - Indices of multifactor productivity, primary metal industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	88.7	87.6	86.9	85.6	82.5	78.2
1962	90.8	89.4	89.2	87.7	83.5	79.1
1963	91.6	90.1	90.2	88.4	84.2	80.0
1964	93.4	91.7	92.2	90.3	89.3	85.1
1965	95.1	93.5	94.1	92.3	91.3	86.4
1966	94.5	93.1	93.5	91.9	89.3	85.2
1967	92.1	91.0	90.7	89.4	87.8	83.3
1968	95.0	93.8	94.1	92.7	89.9	86.0
1969	95.6	94.5	94.8	93.6	90.2	87.0
1970	95.1	93.9	94.1	92.9	88.7	85.5
1971	94.6	93.6	93.6	92.5	85.2	82.7
1972	96.3	95.0	95.6	94.1	87.6	85.0
1973	98.3	96.9	97.8	96.3	95.1	91.0
1974	99.1	97.6	98.7	97.1	90.4	86.9
1975	96.0	95.4	95.2	94.5	85.7	83.9
1976	93.5	92.9	92.4	91.7	85.1	83.7
1977	96.7	96.0	96.0	95.3	88.0	85.6
1978	98.1	97.3	97.7	96.7	91.4	88.7
1979	94.6	93.5	93.7	92.4	87.2	84.8
1980	92.6	91.6	91.4	90.2	86.2	83.5
1981	95.2	94.6	94.3	93.6	85.6	83.5
1982	89.8	89.6	88.0	87.8	81.0	81.3
1983	94.5	94.3	93.6	93.3	87.1	87.2
1984	98.6	97.7	98.4	97.4	96.9	96.3
1985	100.8	100.8	100.9	101.0	100.8	100.6
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.4	102.3	102.8	102.7	107.1	106.5
1988	102.7	102.3	103.2	102.6	108.2	107.4
1989	103.1	102.9	103.6	103.4	106.1	105.2

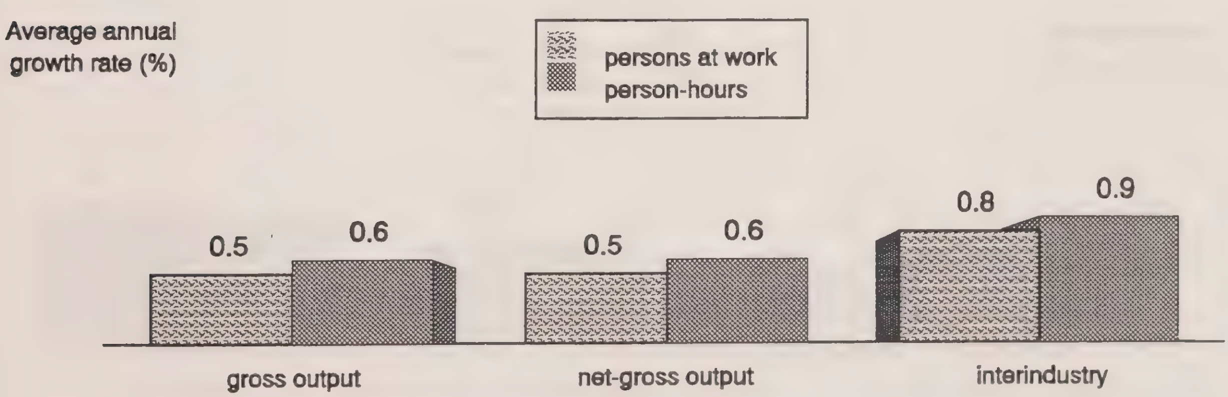


Table 20 - Indices of multifactor productivity, fabricated metal products industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	79.6	78.7	77.9	77.0	71.6	69.9
1962	83.5	82.3	82.1	80.9	77.1	75.0
1963	85.3	83.7	84.1	82.4	79.7	77.1
1964	88.5	86.9	87.6	85.8	84.3	81.7
1965	91.1	89.5	90.5	88.7	87.5	84.9
1966	91.3	89.7	90.6	88.9	87.7	85.3
1967	90.1	88.6	89.3	87.7	85.8	83.7
1968	91.9	90.4	91.3	89.6	88.8	86.6
1969	92.3	90.9	91.7	90.2	90.2	88.3
1970	90.7	89.5	90.0	88.7	88.7	87.0
1971	92.9	91.6	92.3	91.0	90.5	89.1
1972	94.6	93.4	94.2	92.9	93.0	91.4
1973	97.0	95.9	96.8	95.6	97.7	96.4
1974	98.0	97.4	98.0	97.2	98.2	97.3
1975	94.5	93.9	94.1	93.5	91.9	91.3
1976	96.3	95.7	96.0	95.4	93.9	93.2
1977	96.8	96.2	96.6	96.0	94.8	94.4
1978	97.4	96.6	97.2	96.4	95.7	95.1
1979	94.4	94.1	94.0	93.7	92.8	92.4
1980	95.5	95.1	95.2	94.8	92.3	92.1
1981	97.2	97.0	97.1	96.9	93.9	94.2
1982	94.8	94.8	94.5	94.5	88.1	88.4
1983	96.1	96.4	95.8	96.1	92.4	93.0
1984	99.6	99.7	99.6	99.6	99.7	99.7
1985	101.4	101.3	101.5	101.4	102.4	102.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.5	99.5	99.5	99.4	100.2	99.9
1988	99.2	99.1	99.1	99.1	99.3	98.9
1989	98.8	98.7	98.7	98.6	98.3	98.3

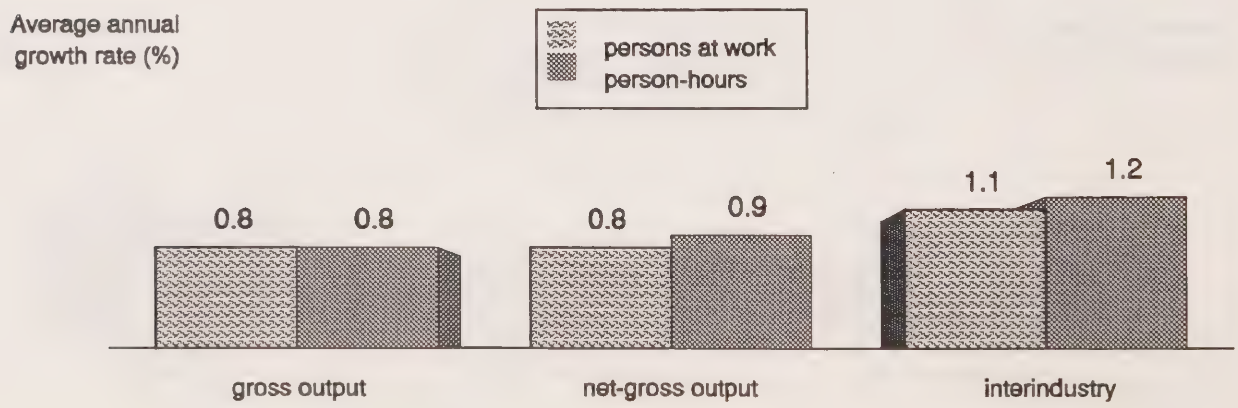


Table 21 - Indices of multifactor productivity, machinery industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	82.5	82.4	81.9	81.7	74.1	73.2
1962	86.8	86.0	86.2	85.5	79.2	77.4
1963	89.2	88.2	88.7	87.7	83.3	81.0
1964	93.2	92.0	92.9	91.6	88.6	86.0
1965	94.0	92.5	93.8	92.1	89.8	87.0
1966	95.3	93.9	95.1	93.6	91.2	88.7
1967	93.9	92.8	93.6	92.5	88.8	86.8
1968	93.0	91.9	92.7	91.5	89.1	87.1
1969	95.5	94.6	95.3	94.4	92.0	90.4
1970	94.4	93.7	94.2	93.4	91.3	90.0
1971	96.4	95.6	96.2	95.4	93.6	92.2
1972	97.3	96.6	97.2	96.4	95.6	94.2
1973	99.1	98.7	99.0	98.6	99.2	98.1
1974	100.2	100.2	100.2	100.2	100.3	99.6
1975	96.7	96.8	96.5	96.6	94.7	94.3
1976	97.2	97.3	97.1	97.2	95.8	95.5
1977	98.7	99.2	98.6	99.2	97.4	97.8
1978	100.9	101.0	101.0	101.0	99.7	99.5
1979	104.3	104.5	104.5	104.8	103.5	103.5
1980	102.6	103.0	102.8	103.2	101.1	101.3
1981	100.0	100.6	100.0	100.6	98.7	99.2
1982	92.2	92.9	91.7	92.5	88.3	89.0
1983	91.0	91.5	90.4	91.0	88.3	89.0
1984	98.3	98.4	98.2	98.3	97.4	97.5
1985	99.6	99.7	99.6	99.7	99.4	99.6
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	97.8	97.5	97.7	97.4	98.3	97.8
1988	99.0	99.0	99.0	98.9	99.9	99.6
1989	98.2	98.2	98.1	98.1	98.9	99.0

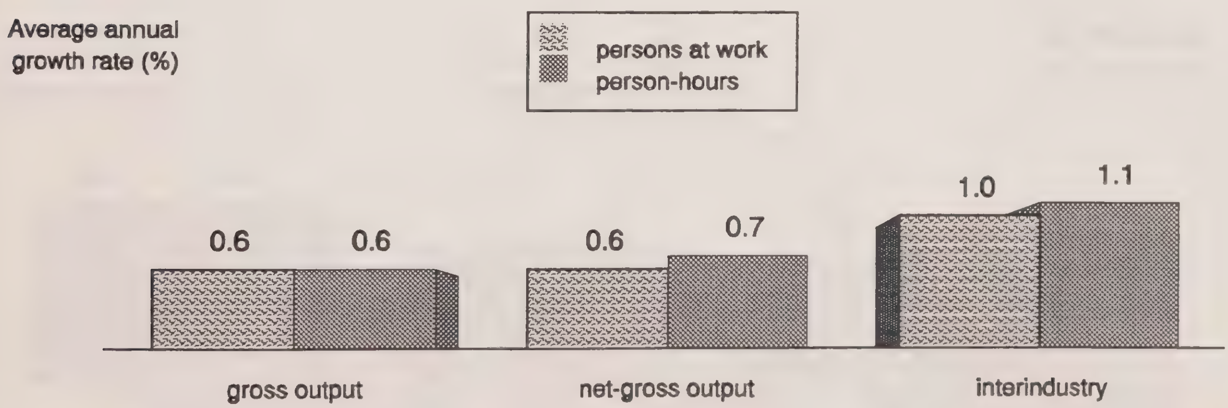


Table 22 - Indices of multifactor productivity, transportation equipment industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	70.7	70.6	67.5	67.4	61.4	60.6
1962	73.9	73.3	71.2	70.5	65.7	64.4
1963	76.8	76.0	74.5	73.6	69.5	67.8
1964	77.3	76.7	75.0	74.4	70.8	69.5
1965	80.2	79.5	78.4	77.7	74.5	73.0
1966	78.7	78.3	76.7	76.2	73.2	72.0
1967	81.4	81.3	79.7	79.7	75.9	75.2
1968	83.5	83.0	82.0	81.5	78.8	77.6
1969	87.3	86.9	86.3	85.9	83.4	82.5
1970	83.8	84.0	82.4	82.7	79.7	79.5
1971	88.1	88.3	87.1	87.4	84.5	84.4
1972	91.1	91.1	90.3	90.3	88.6	88.1
1973	94.7	94.6	94.2	94.1	93.5	93.0
1974	95.1	95.4	94.6	95.0	93.6	93.7
1975	97.0	97.3	96.6	97.0	94.4	94.6
1976	98.0	98.5	97.8	98.3	96.0	96.3
1977	99.1	99.1	98.9	98.9	97.2	97.2
1978	98.8	99.3	98.6	99.1	97.1	97.6
1979	98.2	99.2	97.9	99.0	96.8	97.7
1980	92.5	93.7	91.9	93.2	90.4	91.7
1981	94.0	94.9	93.5	94.5	92.0	93.2
1982	92.7	94.1	92.1	93.6	89.1	90.7
1983	95.9	96.8	95.6	96.5	93.9	95.0
1984	99.9	100.3	99.9	100.3	99.5	99.9
1985	101.0	101.3	101.1	101.4	101.1	101.4
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	98.6	98.3	98.5	98.2	98.8	98.5
1988	100.0	99.9	100.0	99.9	100.7	100.5
1989	99.7	100.3	99.7	100.3	100.1	100.7

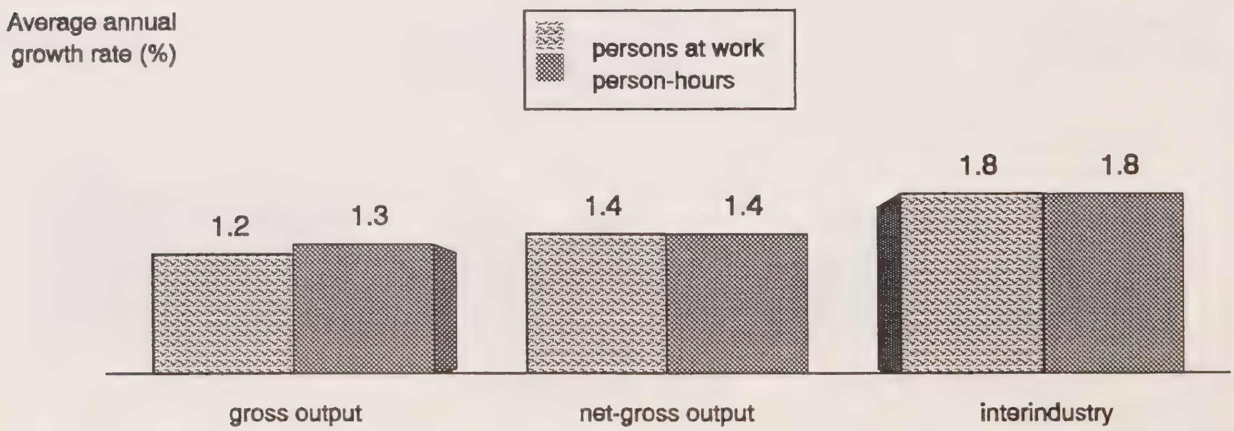


Table 23 - Indices of multifactor productivity, electrical & electronic products industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	66.7	66.7	64.1	64.0	54.6	54.2
1962	71.6	71.6	69.3	69.3	60.3	59.6
1963	72.1	72.2	69.9	70.0	61.0	60.5
1964	74.9	74.8	72.9	72.8	64.1	63.5
1965	76.6	76.7	74.8	74.9	66.3	65.7
1966	77.5	77.1	75.7	75.4	67.6	66.7
1967	73.7	73.9	71.6	71.9	63.6	63.3
1968	75.8	76.1	73.9	74.2	65.8	65.6
1969	77.9	78.2	76.2	76.5	68.5	68.4
1970	77.1	76.9	75.4	75.1	67.3	66.6
1971	73.6	73.4	71.6	71.3	65.1	64.7
1972	77.4	77.1	75.6	75.3	70.6	70.1
1973	80.9	80.5	79.4	78.9	75.1	74.4
1974	80.6	80.3	79.1	78.7	75.2	74.4
1975	79.0	78.9	77.3	77.2	72.7	72.4
1976	82.0	82.1	80.6	80.7	76.4	76.4
1977	84.8	85.1	83.6	83.9	79.1	79.7
1978	84.1	84.1	82.8	82.8	78.4	78.2
1979	90.0	90.1	89.2	89.3	85.9	85.9
1980	93.3	93.6	92.8	93.1	90.3	90.4
1981	94.3	94.7	93.9	94.3	91.4	92.0
1982	90.9	91.1	90.2	90.5	87.2	87.6
1983	91.2	91.2	90.6	90.6	88.5	88.6
1984	97.1	97.4	96.9	97.2	96.8	97.3
1985	99.1	98.8	99.0	98.7	98.9	98.7
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.2	100.9	101.2	100.9	101.9	101.5
1988	103.1	103.1	103.3	103.3	104.4	104.1
1989	103.7	103.6	103.9	103.9	104.9	104.7

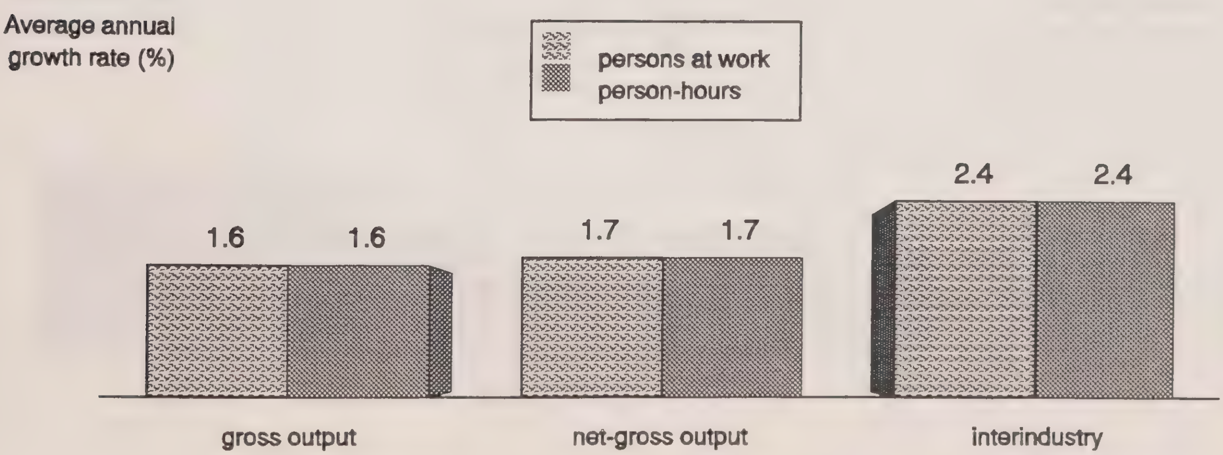


Table 24 - Indices of multifactor productivity, non-metallic mineral products industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	84.9	82.9	83.5	81.2	64.4	61.6
1962	90.5	88.2	89.5	87.0	69.6	66.6
1963	91.2	89.2	90.4	88.0	70.9	67.8
1964	94.5	92.1	94.0	91.3	75.7	72.0
1965	96.3	93.5	96.0	92.8	79.0	75.0
1966	96.4	94.1	96.2	93.5	78.8	75.0
1967	91.0	89.0	90.1	87.8	76.6	72.7
1968	94.4	92.4	93.8	91.7	79.9	76.3
1969	96.0	94.0	95.7	93.4	82.4	78.8
1970	94.3	92.8	93.7	92.0	80.1	78.2
1971	100.3	98.8	100.6	98.8	85.2	83.1
1972	107.1	105.6	108.2	106.5	92.6	90.0
1973	101.5	100.4	101.9	100.6	96.3	93.9
1974	97.5	96.7	97.4	96.4	94.9	93.0
1975	94.7	93.8	94.2	93.3	91.8	90.4
1976	95.5	94.8	95.1	94.4	94.2	93.2
1977	94.6	93.8	94.1	93.3	92.5	91.3
1978	96.0	95.3	95.7	94.9	95.5	94.2
1979	96.4	95.7	96.2	95.4	96.6	95.2
1980	90.7	90.6	89.7	89.7	88.6	88.1
1981	90.1	90.2	89.1	89.2	86.6	86.3
1982	84.5	84.8	82.8	83.2	78.9	79.1
1983	90.0	90.1	89.0	89.0	87.3	87.2
1984	94.5	94.4	93.9	93.8	94.3	94.0
1985	98.3	98.2	98.1	98.1	97.6	97.6
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.3	102.0	102.6	102.2	105.2	104.4
1988	102.4	101.9	102.6	102.1	106.7	106.1
1989	100.5	100.0	100.5	100.0	102.8	102.0

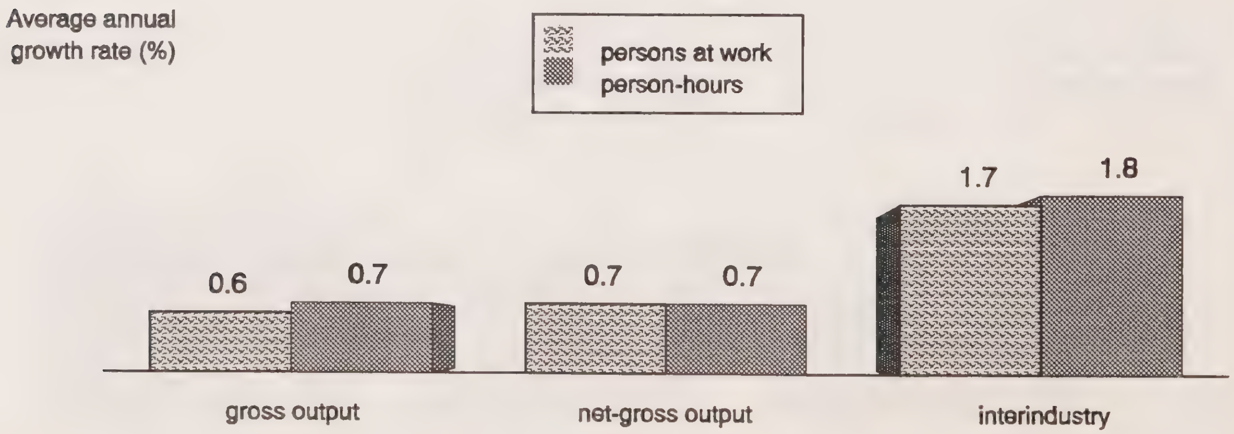


Table 25 - Indices of multifactor productivity, refined petroleum & coal products, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	84.9	84.7	84.6	84.4	97.7	96.2
1962	89.4	89.2	89.2	89.0	104.0	102.3
1963	90.3	90.0	90.2	89.9	106.8	105.3
1964	92.4	92.0	92.2	91.9	111.5	109.9
1965	94.3	94.0	94.2	93.9	114.7	112.9
1966	96.1	95.6	96.0	95.5	118.7	116.8
1967	92.1	91.7	92.0	91.6	114.9	113.2
1968	94.0	93.6	93.9	93.4	120.1	118.3
1969	92.4	92.2	92.2	92.0	119.6	118.6
1970	92.6	92.5	92.4	92.3	123.4	122.3
1971	93.0	92.8	92.9	92.7	125.0	123.8
1972	92.8	92.7	92.6	92.5	130.2	129.1
1973	96.3	96.3	96.2	96.2	138.6	137.8
1974	95.7	95.8	95.7	95.7	134.4	133.6
1975	96.3	96.4	96.2	96.4	127.5	127.1
1976	95.7	95.9	95.6	95.8	122.3	121.9
1977	98.7	98.8	98.6	98.8	123.1	122.8
1978	96.5	96.7	96.4	96.6	114.4	114.2
1979	95.2	95.3	95.1	95.2	114.9	114.6
1980	95.6	95.8	95.5	95.7	106.5	106.2
1981	97.7	97.9	97.7	97.8	102.5	102.2
1982	100.0	100.2	100.0	100.2	101.2	101.0
1983	101.6	101.6	101.7	101.6	103.4	103.2
1984	102.2	102.2	102.3	102.2	105.3	105.1
1985	101.1	101.0	101.2	101.1	104.8	104.3
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.8	100.7	100.9	100.8	105.0	104.9
1988	101.0	101.1	101.0	101.1	110.9	110.7
1989	100.1	100.1	100.1	100.1	109.2	109.2

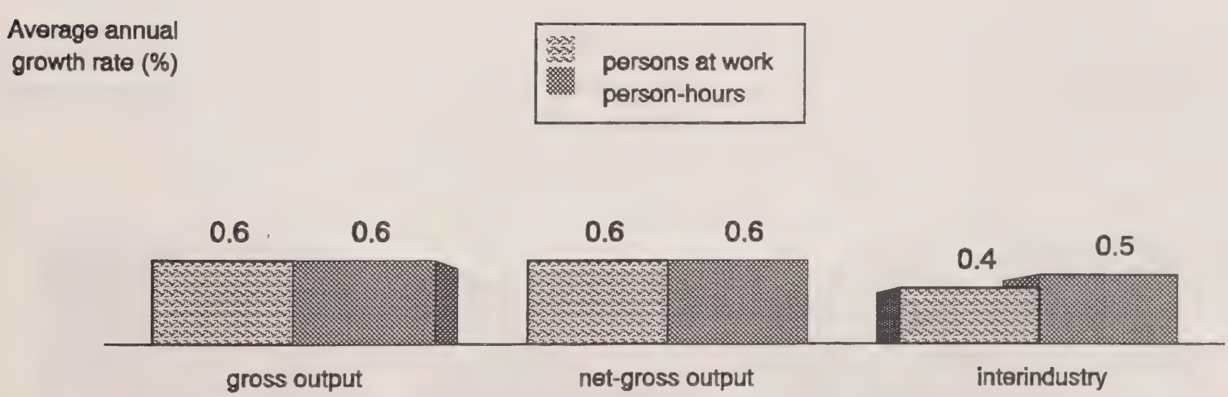


Table 26 - Indices of multifactor productivity, chemical & chemical products industries, (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1961	73.7	73.5	70.1	70.0	64.0	62.2
1962	75.8	75.7	72.5	72.4	66.7	64.9
1963	77.9	77.8	74.8	74.7	69.9	68.2
1964	80.8	80.6	78.0	77.8	73.3	71.6
1965	82.6	82.0	80.0	79.3	76.0	73.9
1966	82.6	82.6	80.0	80.0	77.2	75.8
1967	81.1	81.1	78.3	78.4	75.1	74.0
1968	81.7	81.7	79.1	79.0	77.0	75.9
1969	83.2	83.0	80.7	80.4	79.6	78.4
1970	82.7	82.6	80.1	80.0	80.3	79.1
1971	85.5	85.4	83.2	83.1	84.7	83.5
1972	87.5	87.4	85.4	85.3	87.2	86.3
1973	91.2	91.2	89.6	89.5	92.2	91.1
1974	91.1	91.2	89.4	89.5	92.1	91.4
1975	86.2	86.3	83.8	83.9	86.1	85.4
1976	88.8	89.8	86.8	87.9	89.4	89.9
1977	89.2	89.3	87.3	87.4	90.8	90.4
1978	91.7	91.8	90.1	90.2	93.1	92.6
1979	93.5	94.0	92.2	92.8	95.4	95.7
1980	91.0	91.5	89.2	89.8	91.3	91.4
1981	93.7	94.3	92.5	93.2	94.5	95.0
1982	88.5	89.2	86.2	87.0	86.9	87.5
1983	95.5	95.7	94.6	94.8	93.7	93.8
1984	98.6	98.8	98.3	98.5	98.3	98.6
1985	99.5	99.7	99.4	99.6	100.1	100.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.6	101.6	101.9	102.0	102.6	102.5
1988	103.1	103.2	103.8	103.8	104.5	104.4
1989	103.3	103.1	103.9	103.8	103.8	103.5

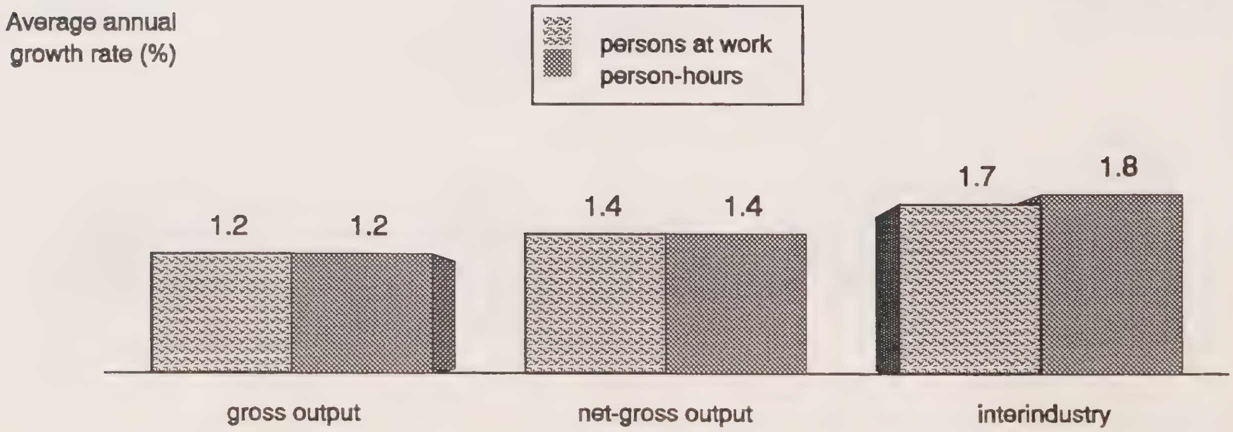
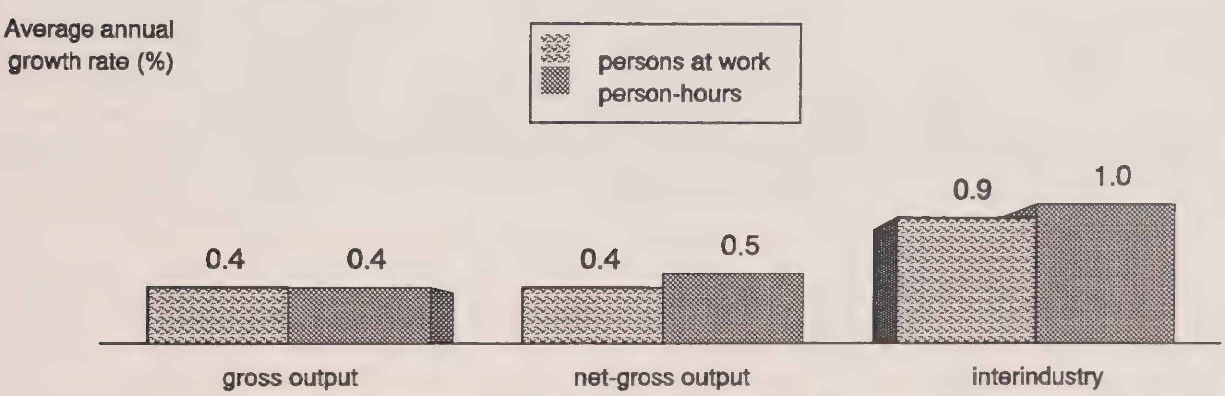


Table 27 - Indices of multifactor productivity, other manufacturing industries, (1986=100)

Year	Industry measures: Gross output: Persons at work	Industry measures: Gross output: Person-hours	Industry measures: Net-gross output: Persons at work	Industry measures: Net-gross output: Person-hours	Interindustry measures: Persons at work	Interindustry measures: Person-hours
1961	87.3	85.8	86.9	85.3	77.6	75.3
1962	89.3	87.3	89.0	86.9	80.0	77.0
1963	88.4	86.4	88.0	85.9	80.0	77.0
1964	91.8	89.4	91.5	89.0	84.3	80.7
1965	91.7	89.5	91.4	89.1	84.5	81.0
1966	93.6	91.5	93.4	91.2	86.6	83.4
1967	91.4	89.6	91.1	89.3	83.5	80.6
1968	94.3	92.9	94.1	92.6	87.5	85.0
1969	96.1	94.4	95.9	94.2	90.1	87.4
1970	94.1	92.7	93.9	92.4	88.2	85.8
1971	95.5	94.1	95.3	93.9	90.5	88.2
1972	99.3	98.2	99.2	98.1	96.0	93.9
1973	101.1	100.3	101.1	100.3	99.4	97.5
1974	100.5	99.5	100.5	99.4	97.6	95.7
1975	98.6	97.7	98.6	97.6	94.0	92.6
1976	103.5	103.0	103.6	103.2	100.1	99.1
1977	104.2	103.8	104.4	104.0	100.2	99.4
1978	104.9	104.6	105.2	104.8	101.5	100.6
1979	103.5	103.1	103.7	103.2	100.8	100.0
1980	101.2	101.0	101.3	101.0	98.7	98.2
1981	102.6	102.4	102.7	102.5	100.2	99.7
1982	102.0	102.2	102.1	102.3	97.6	97.7
1983	101.6	101.6	101.7	101.7	98.7	98.6
1984	105.4	105.0	105.7	105.3	104.8	104.2
1985	106.1	105.3	106.4	105.5	105.8	105.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.0	101.3	101.1	101.4	101.9	101.9
1988	98.9	99.4	98.9	99.4	100.7	100.9
1989	97.3	96.8	97.2	96.7	99.0	98.3



APPENDIX 1

Basic Concepts and Methods

1 - Multifactor Productivity in a Nutshell

The multifactor productivity accounts intend to measure the performance of the Canadian economy in production activities. It is assumed that resources are optimally allocated between the various production activities so that the object of the performance indicators is solely to reveal the technical *efficiency* with which the available resources are used in each of these production activities or groups of activities.

These indicators, in contrast with the labour productivity indices regularly presented in this publication, take into account the contribution of all productive factors (inputs) to the growth of outputs. For this reason, they are called *multifactor* or *total* factor productivity indices. The labour productivity measures presented in Part 1 of this publication take into account only the contribution of labour input to the growth of output and, for this reason, constitute *partial* measures of productivity.

In general, productivity gains are defined in a residual fashion as the growth in output not accounted for by the growth in production factors explicitly listed in the chosen formula. Multifactor productivity measures output per unit of all factors of production combined (such as labour, capital, materials and services used as inputs in the production of goods and services). Consequently, multifactor productivity does not reveal the contribution of the production factors but the joint effects of technical progress, economies of scale, and other factors not explicitly taken into account.

This publication presents two complementary categories of multifactor productivity indices. One category takes into account only the direct productivity gains made by an industry without considering the indirect productivity gains made by its suppliers. The other looks at the productivity gains made in the production of the goods and services of an industry by taking into account the productivity gains made by all industries which contributed directly and indirectly to that production. This measure basically consists in a measure of productivity by product category rather than by industry.

The first category of indices, based on the most usual concept of multifactor productivity, measures the productivity gains taking place within an industry, from the point of view of that industry *taken in isolation* from the rest of the business sector of the economy. The index measures the growth in the gross output of an industry unaccounted for by the growth in all of its factors of production; that is, both the inputs called primary, which are the labour and capital inputs, and the intermediate inputs, which are the materials and services purchased from other industries. This index does not take into account the productivity gains which take place in the industries which produce these intermediate inputs[32]. We will refer to this index as the *industry* index.

[32] *Except in some cases for intermediate inputs originating from the industry itself as will be explained below.*

The second category of productivity indices takes into account the productivity gains realized in the upstream supplying industries. It is based on the *interindustry* concept[33] of interdependence which is relatively new in the context of multifactor productivity analysis. This index takes into account both the productivity gains made within an industry and those made by industries supplying directly or indirectly the intermediate inputs. The index measures the growth in the output of an industry unaccounted for by the growth in all its primary inputs as well as by the growth in the primary inputs used in the production of its intermediate inputs by its direct and indirect industry suppliers. In that perspective, the interindustry productivity index takes into account all the primary inputs which have been used in *the business sector as a whole* to produce the goods and services of a given industry. In other words, each industry is viewed as an integrated component of the business sector of the economy rather than as an isolated entity.

Measuring the performance of an *economy* at producing the output coming out of a given industry using the interindustry concept is quite different from measuring the performance of that same *industry* in the traditional way. Both measures are useful. For instance, in an effort to assess the performance of an economy it would be inappropriate to consider the declining industries with low productivity gains without also looking at the performance of the industries supplying them with goods and services. The latter industries, which may benefit from important productivity gains, may also be strongly dependent on the low performance industries for the sale of their output.

2 - The Concept and Measurement of Productivity

The *level* of productivity is a ratio between the level of production of industries and the quantity of inputs they use. Although there may be alternative ways to compute the productivity ratio, all of these consist in combining all the goods and services produced into a single *aggregate output index* and, likewise, all of the production factors used into a single *aggregate input index*. The aggregation of the goods and services produced or used in the production process requires that these goods and services be measured in some common units. Similarly to the weights and measures in physics, index numbers use the relative value of the goods and services at some specific point in time as the common unit of measure. They are in fact weighted averages where each good/service is attributed a weight according to its contribution to the value of the aggregate of which it is a part of. Thus, the greater the nominal value of the good/service, the larger share it will have in the aggregate.[34] The multifactor productivity index *level* is computed as the ratio of the aggregate output index to the aggregate input index. Productivity *growth* is positive if the aggregate output index grows faster than the aggregate input index. Productivity decreases in the opposite case.

For empirical applications, some choices have to be made on how to actually measure inputs and outputs. One criterion which we have used is the inclusion of all production activity taking place in the business sector. This implies that the indices, at the industry level, are defined on a *gross output* measure of their activities. The gross output of an industry is the aggregate volume of all goods and services produced and work done by the industry. Gross output can be defined as either including or excluding intra-industry sales as will be discussed further below. Other investigators have used different definitions of output such as, gross output net of depreciation of the capital stock. The labour productivity indices presented in this publication use a real value-added measure of output.

[33] *The concept and the empirical estimates were first introduced by T.K. Rymes in a previous study done for Statistics Canada. See T.K. Rymes and A. Cas, "On the Feasibility of Measuring Multifactor Productivity in Canada", Statistics Canada, Input-Output Division, 1985. However, contrary to Rymes and Cas, we include the capital stock in the primary inputs rather than in intermediate inputs.*

[34] *This can be established more formally as the Divisia aggregation formula for a twice differentiable linearly homogeneous production function under competitive market conditions and profit maximisation. The time continuous Divisia index is approximated by the chained Tornqvist index..*

Correspondingly, on the input side, the measure of the index has to be inclusive of all used (and measurable) inputs which can be classified into two broad categories: (1) *intermediate* inputs which are comprised of the many goods (raw materials) and services purchased by the industries, and (2) *primary* inputs including labour inputs, capital inputs, and natural resources. More precisely, intermediate inputs are considered to be those inputs which are produced and are consumed during the same period (usually a year) by the business sector. The primary inputs[35] are supplied from other sectors of the economy such as the household sector. As discussed further below, imports and a few other variables can also be included in the set of primary inputs.

In the estimation of the multifactor productivity indices, a more detailed breakdown of both the inputs and outputs by commodity were used as described in Appendix 2 of Part 2. The more disaggregated (and consequently more homogeneous) set of commodities used improves the quality of the measured productivity indices and presents a definite advantage over the more aggregated (and more heterogeneous) set of commodities usually used by other investigators. However, due to statistical limitations, natural resources are not presently included in the input set.

The multifactor productivity indices have an important advantage over the partial labour productivity indices. This advantage stems from the inclusion of all the major factors contributing to the growth of output in the economy. Output growth is thus accounted for by increases in productive capacity, by a greater use of various services and goods purchased by industries (including energy) and by the growth in labour input. Output growth which is not accounted for by the growth of inputs is called productivity. Therefore, the more detailed and inclusive is the list of production factors entering into the estimates, the more growth in output can be "explained".

The inclusion of all production factors in the computation of productivity indices does not preclude the computation of meaningful indices of partial productivity. However, in order to analyze and to explain the partial productivity of any contributing production factor, one must first express its productivity in relation to the contribution of the other production factors. For instance, the index of partial labour productivity may have increased because the quantity of equipment, raw materials, and energy used per unit of labour have increased. Only when the contribution of these other factors have been netted out can the partial labour productivity be meaningfully related to factors such as education and experience. Multifactor productivity presents a net advantage on this count compared to labour productivity, precisely because it allows the decomposition of increased labour productivity between the portion which comes from the contribution of the other production factors, and the portion which comes from other factors explaining the increased efficiency of labour, such as education. The labour productivity indices regularly presented in this publication do not allow such a decomposition.

3 - Which Production Activities?

In the application of the concept of productivity, inputs and outputs must be clearly identified. They may refer to the entire Canadian economy and/or to various components of the economy. These components, in the Canadian System of National Accounts, are either *sectors* or *industries*. The productivity indices refer only to the productivity of the resources used by the *business sector* of the economy. In the Canadian

[35] *Capital goods are commodities produced by the business sector like intermediate inputs. However, they are accumulated only if savings occur. In addition, they are excluded from the intermediate input set on the grounds that they are, by definition, not totally consumed during the period in which they have been produced. Extending the interindustry measure over many periods to cover capital goods leads to the dynamic index number formula proposed in R. Durand and M. Salem, "On a Dynamic Productivity Index Number Formula", Input-Output Division, Statistics Canada, November 1987 (revised February 1990).*

System of National Accounts, the business sector "encompasses that group of transactors who produce goods and services for sale at a price which is calculated to cover costs and yield a profit..."[36]. An industry is defined, in the National Accounts, "as a group of operating units [establishments] engaged in the same or similar kind(s) of economic activity, e.g., coal mines, clothing factories, department stores, laundries"[37]. Industries include both business and non business establishments but can be sectored to include only business establishments. The productivity indices presented in this publication refer only, either explicitly or implicitly, to business establishments.

The productivity of the government sector can not be calculated at this time in the framework of the Canadian System of National Accounts. Indeed, the latter adopts as a convention (for lack of a better alternative) to measure the real output of the government sector as being equal to its primary input use. As a consequence, the growth in output cannot diverge from the growth in inputs as required for a meaningful productivity measure.

In summary, the productivity indices provide an accounting record of the effectiveness with which business establishments make use of the economy's resources through time. To make the interpretation of these indices more precise, we still need to clarify further how they are actually derived. Basically, we need to define in a more detailed way the sets of inputs and outputs used in their compilation both conceptually[38] and empirically (see Part 2 Appendix 2).

4 - Which Resources and How are they Measured?

Unemployed resources are excluded from the computation of productivity. Thus, for example, the labour input is measured with persons at work/hours worked rather than with the available labour force. The productivity indices, consequently, do not measure the performance of the economy as a whole which is often reduced by the non-utilization of available resources. Rather, the productivity indices presented here intend to track the evolution of the technical performance of the production processes which would obviously not be well captured if unemployed resources were taken into account.

On the other hand, resources engaged in the production process may not be fully employed as is often the case in economic downturns. Labour hoarding is a classical example: in response to decreasing demand for its product, an establishment may not lay off its employees for various reasons such as the separation costs and the cost of training new employees.

No adjustment for capacity utilisation of inputs is explicitly made to the multifactor productivity indices with one exception. An adjustment is made to take into account the capacity utilization rate of capital by calculating the cost of capital, that is, its share in the index of combined inputs, in a residual manner rather than by calculating it using the user-cost-of-capital approach (interest rates, depreciation rates, and other variables affecting the price of capital services)[39]. However, this correction does not fully eliminate the cyclical fluctuations of the indices and, consequently, does not reveal the trend followed by technical

[36] *Robert B. Crozier, National Income and Expenditure Accounts, Volume 3, A Guide to the National Income and Expenditure Accounts, Definitions-Concepts-Sources-Methods (catalogue 13-549, 1975, p. 101).*

[37] *The Input-Output Structure of the Canadian Economy, 1961-1981 (catalogue 15-510, p. 18).*

[38] *A more precise though more technical description of the conceptual aspects may be found in R. Durand and M. Salem, op. cit.*

[39] *See Berndt, E.R. and Fuss, M.A., "Productivity Measurement with adjustments for variations in capacity utilization and other forms of temporary equilibrium", Journal of Econometrics 33 (1986) 7-29, North-Hollard.*

progress. The sensitivity of the productivity indices to business cycle fluctuations has its advantages. Many would argue that what counts is the measure of the *actual* efficiency with which business firms use production factors at a given time rather than the *potential* (maximum) efficiency of the production factors, were they fully utilized. Over the long run, that is from peak to peak in economic activity, the indices do in fact reveal the increased productivity associated with technological possibilities, either in the form of technical progress or through a better use of all available technologies.

5 - Alternative Measures of Multifactor Productivity

5.1 Two categories of productivity measures. An industry rarely carries out all of the transformations from basic materials to final products. The automobile industry, for instance, uses steel as an intermediate input, which has been produced by the steel industry. Rarely are automobile producers involved in steel manufacturing. The production of steel is part of the total transformation processes involved in the production of automobiles but it is not part of the transformation processes of the automobile industry itself. Thus, if one is interested in the productivity of all the production processes involved in the production of the output of the automobile industry, one must *integrate*[40] the productivity of activities of all industries having participated in such production. This would embrace the industry directly involved in the manufacturing of automobiles (the automobile industry) as well as those industries indirectly involved in supplying the automobile industry with all the necessary parts, materials and services (all the "upstream" industries, such as the steel industry). The *interindustry* productivity estimates pertain to the productivity of groups of industries linked to each other by the flow of intermediate goods and services. Since this measure covers all industries, it can be considered as the productivity of the economy in producing a given bundle of goods or as a product group index of productivity.

From the point of view of the industry, the sources of inputs, whether intermediate or primary, do not matter. From that perspective, inputs are considered as given to the industry although for the economy as a whole these resources had to be either (1) produced by other industries, (2) imported or (3) supplied by households in the form of capital and labour. From that point of view, the industry, *as an isolated entity*, is the universe over which productivity is computed. This is the essence of the *traditional view* on productivity.

The new *interindustry* perspective on productivity is equivalent to the perspective of an observer whose concern lies in the efficiency with which the scarce resources of the *economy as a whole* are being used. One may, in particular, be interested in the efficiency with which an industry, as a component of the business sector rather than as an isolated entity, uses the scarce primary resources available to the business sector of the economy, whether directly or indirectly, by purchasing goods and services from other industries. The latter industries use both primary and intermediate inputs but the intermediate inputs they use also originate from upstream industries so that, going through all interindustry transactions, all intermediate inputs can ultimately be accounted for by uses of primary inputs.

In the example of the automobile industry, the inputs are capital and labour and the intermediate inputs it purchases, such as steel. The inputs of the steel industry include capital and labour inputs and the intermediate inputs it purchases, such as steel ingots. In turn, the steel ingot industry uses its own inputs including capital, labour, as well as iron ore from a mine it owns. When considering the interindustry set of inputs, we know that it takes capital and labour in the ingot industry to extract the ore and to produce ingots, and that it takes the capital and labour of the steel industry to transform the ingots into steel.

[40] *For a full discussion of the concept of integration in relation to productivity measurement, see Durand R., "Aggregation, Integration and Productivity Analysis: An Overall Framework", Aggregate Productivity Measure, 1989, Statistics Canada, (catalogue 15-204), pp. 107-118.*

Downstream, the automobile industry also needs capital and labour to transform the steel into automobiles. Thus, the set of inputs in the interindustry measure of productivity now includes the capital and labour services used directly and indirectly in the production of automobiles. In this perspective, the interindustry concept *integrates* the contribution of upstream industries to the production of its output bundle.

The real degree of vertical integration of industries is constantly changing through the years. It is also quite different from one country to another. Therefore, the comparisons of productivity growth through time or across countries based on the conventional industry indices are always limited by the changing degree of integration through time or the varying degree of integration across countries. At a very disaggregated level, this statistical instability of the traditional productivity measures may become important. Indeed, the industries' establishments may not only be more or less vertically integrated but they can also migrate from one industry to another as their output mix changes through time. By vertically integrating all industries in their calculation, the interindustry productivity indices become insensitive to such "statistical" influences, given these indices an advantage over the industrial measures. Indeed, they measure the productivity of the same production processes whatever the industries in which these processes took place.

From the point of view of the individual interested in the global performance of the business sector as a whole *in the production of some group of commodities*, in particular for international trade studies, the interindustry measure may prove to be more interesting than the traditional industry measure. Indeed, it takes into account not only the efficiency with which various inputs are combined within some industry to produce a given group of outputs but also the efficiency of the industries supplying the intermediate inputs. Thus, to take the example of the motor vehicle industry, this measure takes into account not only the efficiency of the assembly plants, but also the efficiency of the plants producing the auto parts and other raw materials, even including the production of basic minerals and other industries' output located far upstream in the chain of production. The national economy may possess very efficient assembly plants as compared to foreign plants but still remain disadvantaged on the international automobile market because of the relative inefficiency of the industries which "feed" its motor vehicle industry.

In fact, it seems advantageous to use both measures of productivity as they provide complementary information. The industry measure isolates the efficiency of the motor vehicle industry segment in the production of automobiles. The joint use of both measures allows the analysis of the overall efficiency of production processes (vertically integrated industries) as well as the efficiency of each of its (isolated industry) segments.

5.2 Two concepts of gross output. As mentioned above, in addition to the standard gross output measure derived from the input-output tables, one may adopt another production concept for the purpose of estimating multifactor productivity: the gross output net of all intra-industry flows. According to Gullickson and Harper[41],"...removing intra-industry transactions assures that changes in vertical integration through time in the census data do not bias the estimates." This advantage refers only to intra-industry integration while the interindustry measure introduced above possesses the same advantage over both intra- and interindustry sales.

The concept of net-gross output[42] has the further advantage of smoothing the aggregation process. According to the traditional approach, the concept of gross output is maintained at all levels of aggregation except at the total business sector level where the productivity measure based on value-added is considered. Even for broad aggregates such as goods industries and services industries, multifactor

[41] *W. Gullickson and M.J. Harper, "Multifactor Productivity Measurement for Two-Digit Manufacturing Industries", paper presented at the 1986 meeting of the Western Economic Association in San Francisco, July 1-5, 1986.*

[42] *For a full discussion of the net-gross output concept of productivity, see Diaz, A. "Alternative Concepts of Output and Productivity", Aggregate Productivity Measures 1989, Statistics Canada, catalogue 15-204, pp. 97-106.*

productivity measures are defined on gross output while productivity of the business sector is defined on value-added. The measure of output is therefore abruptly changed from gross output for broad aggregates to value-added for the total. In contrast, the net-gross output measure converges gradually towards value-added as, when moving to broader aggregates, intermediate inputs are progressively reclassified from *interindustry* sales to *intra-industry* sales and subtracted from gross output.

6 - Aggregate Business Productivity

The discussion of the various concepts has hitherto been made with reference to the industry as the main subject. What about multifactor productivity measures for the total business sector? What impact has the aggregation level on the definition of output and inputs? The answers to these questions are the main focus of this section.

If we wish to measure the productivity of the business sector in producing goods and services to be sold outside the sector, the industrial measure of multifactor productivity based on gross output is inadequate. The sum of the gross outputs of all industries in the business sector corresponds to much more than the outbound production as it includes all goods and services bought by other industries and used as intermediate inputs in the production of other goods and services. This is why the aggregate productivity index on gross output is not calculated in the framework of Statistics Canada's productivity program.

The question is now: what are the appropriate measures of productivity at the aggregate level? First, let us consider the net-gross output model, where intra-industry sales are netted out from both output and inputs. In this model, the output includes the production of goods and services delivered outside the sector and the inputs include all the resources available to the business sector, that is its primary inputs (labour and capital) and the inputs originating from the other sectors of the economy and from outside the economy (imports). On the other hand, the interindustry measure takes into account the direct and indirect primary inputs (capital, labour, and inputs originating outside the sector) used in domestic production. For the total business sector, the index based on net-gross output is equal to the interindustry index as both measures refer to the same inputs and output.

The two preceding measures are based on an approach that treats the business sector as an entity which is isolated from the rest of the economy and of the world. In this perspective, what matters is only the production delivered outside the sector and the inputs not produced by the business sector, whether they are imported or originating from other sectors (capital, labour). These measures statistically integrate the production activities within the business sector, but not with the rest of the economy or the world.

In contrast, the multifactor productivity measure based on value-added reflects the real degree of integration between the business sector and the rest of the world. From the perspective of the world economy, goods and services exchanged between countries are intermediate inputs. The fabricated inputs coming from outside the business sector (such as imports of goods and services) must not be counted in the inputs. The output therefore corresponds to the value-added of the business sector while the inputs include only capital and labour. Since the business sector is then considered as being integrated with the world economy, transactions with other parts of the world economy are deemed to be intraindustrial.

In summary, there are two measures which are relevant for the total business sector. First, there is the measure based on net-gross production and the interindustry measure which are equal, and second, there is the productivity measure based on value-added. The net-gross measure is sensitive to changes in the integration of the domestic economy with the rest of the world whereas the value-added measure is not

because it already treats the inputs and outputs as if the domestic economy were completely integrated with the world economy.

In practice, productivity measures for the total business sector are constructed by aggregating the more detailed measures. This is done using aggregation weights. These weights vary according to the production model considered.

7 - Usefulness of Productivity Indices in Economic Analysis

As indicated above, the main purpose of the multifactor productivity measures is to separate the observed growth in industrial production into increases in the economic resources employed by industries and increases in overall efficiency. This step allows a more complete accounting of the sources of economic growth than the partial measures presented in the framework of the Canadian System of National Accounts. Time series of multifactor productivity by industry also allow analysts to measure trends and detect shifts in competitive advantages among various Canadian industries vis-a-vis similar industries in the rest of the global economy. By showing how industries' evolution has been influenced by their technical performance, the assessment of multifactor productivity helps analysts and policy makers to address such issues as domestic industrial policy and international industrial strategy. Similarly, businesses and other private organizations observe productivity movements to evaluate the long-term viability of various industries and make more informed investment decisions.

In addition, proper growth accounting opens the way to a better understanding of the sources of productivity growth. The latter can be conceptually decomposed into three components: economies of scales, technical progress and measurement errors due to omitted factors. Growth accounting paves the way to further analysis of the sources of economies of scale and technical progress. Taking technical progress as an example, it could be defined as the general advance in knowledge. If we accept this definition, then, over the long run, technical progress is the only source of *permanent and sustained* improvement in productivity. Indeed, at any point in time, the level of education of workers may be raised only to a certain limit through investments in education. Similarly, the diffusion of the best known technologies through investments in physical equipment has a limit as well as the best use of existing technical possibilities through economies of scale. Only investments in fundamental research in both human and natural sciences and investments in applied research and development can lead to a better and more educated labour force and better equipment over the very long run. Measuring the contribution of technical progress to the growth in output helps in understanding the importance of society's investment in such research.

APPENDIX 2

Description of the Multifactor Productivity Database

1 - Introduction

In order to derive multifactor productivity indices, prices and volumes of outputs and inputs are estimated from various sources. For outputs and intermediate inputs by industry, the data are obtained from the current and constant price Canadian input-output tables[43]. Some transformations of these data are required to obtain better conceptual measures for the purpose of estimating multifactor productivity. These transformations are summarized in this appendix. Some of them were suggested by Rymes and Cas in an earlier study[44]. Primary input costs are also taken from input-output tables while their volumes are estimated from other sources. Labour input data are taken from the labour productivity program in the case of employment while estimates of hours worked were developed specifically for the multifactor productivity program. Capital input data are described in a technical note which is summarized below[45]. The industry coverage of the business sector used for multifactor productivity estimates differs slightly from the usual definition of the national accounts in both Canada and United States as explained in further detail in Appendix 3.

2 - Input-Output Commodity Data

The input-output tables are estimated at both *producers'* and *purchasers'* prices. Producers' prices are the prices received by the sellers at the boundary of their establishment. Purchasers' prices correspond to the market prices at the point of delivery and include various margins which are not taken into account in the producers' prices. Some of these margins are paid to business sector enterprises in exchange of real services such as retail and wholesale services and transportation services. Commodity indirect tax margins, on the other hand, represent a pure transfer without any real counterpart.

As the proposed productivity measures are derived under the assumption of competitive market behaviour, it can be argued that outputs of industries should be valued at producers' prices while their inputs should be valued at purchasers' prices. The *Divisia* index of productivity growth, which is used here, rests on the assumption of profit maximization behaviour of firms in competitive markets. This implies that the marginal product of each input be equated to its real price defined as the purchasing cost of the input including all margins divided by the net selling price of the output, excluding all margins. But as real margins represent real inputs which can be substituted for other inputs over the long run, they were considered as distinct

[43] *For informations on data sources and concepts, refer to The Input-Output Structures of the Canadian Economy, 1961-1981 (Revised Data), Statistics Canada, Catalogue no. 15-510, Input-Output Division, 1987, pp. 1-127.*

[44] *Rymes T.K. and A. Cas, "On the Feasibility of Measuring Multifactor Productivity in Canada", Input-Output Division, Statistics Canada, 1985.*

[45] *For a detailed documentation on capital input, see Documentation of Capital Input and Capital Cost Time Series for Multifactor Productivity Measures, by M. Salem, R. Fortin and Y. Sabourin, Statistics Canada, Input-Output Division, December 1990.*

inputs rather than included in the physical volumes of the other inputs. Tax margins were excluded from the input set. All commodity input and output volumes were therefore taken from the producers' prices input-output tables. In current prices, commodity taxes paid were added to the value of commodities purchased.

Conceptually, operating subsidies can be considered as negative indirect taxes. Therefore, they were distributed over the input and output commodities to which they apply. Some subsidies, however, could not be attributed to specific commodities and were treated as non commodity indirect taxes (see below).

Royalties were considered as taxes levied on industries' outputs in the productivity accounts. They were subtracted from the producers' prices of outputs to estimate the net prices received by producers. Royalties are considered as a rental income on natural resources received by the business sector industry *Government Royalties on Natural Resources* in the input-output tables. However, this is an improperly defined industry for productivity analysis as it has no inputs except for the *Other operating surplus* which is equated to the royalties perceived. The industry was also excluded on the grounds that it appeared doubtful that governments act as a real monopoly in natural resources industries.

Since government goods and services cannot be substituted by other business industry supplies, they are added to primary inputs. As well, unallocated imports and exports of commodities are considered as part of the primary inputs. In general, all commodities which are not produced by the business sector are considered as primary commodities. This is the case, for instance, of postal services.

Dummy industries have been removed from the input-output tables. Corresponding dummy commodity inputs have been transformed into real inputs on the basis of the input structure of dummy industries.

3 - Labour Input at Current and Constant Prices

As in the case of labour productivity, the estimates of multifactor productivity will be calculated, from now on, with two different measures of labour input: the average annual number of persons at work and the number of hours devoted to work. The first includes employment of paid workers and employment than other-than-paid workers (self-employed and unpaid family workers). The employment estimates are the same as those used to calculate labour productivity. The data sources for employment are described in Appendix 2 of Part 1 of this publication. The measure of hours worked is presented in detail in the feature article entitled *Hours Worked: A New Measure of Labour Input for Multifactor Productivity.*

The labour income of self-employed workers is an imputation based on the assumption that, in most industries, self-employed workers earn the same hourly rate as the paid workers. However, in the case of industries where professional self-employed workers are numerous (doctors, dentists, lawyers, accountants, engineers), since the average earnings of paid workers in the same industry division underrepresent the earnings of these occupations, tax data on average labour income was used. Consequently, labour income of the self-employed is afterward deducted from net income of unincorporated businesses to preserve the balance in the accounting system.

4 - Capital Input at Current and Constant Prices

The input of capital services for a given year is assumed to be proportional to net capital stock in constant prices at the end of the previous year. The choices of a net rather than a gross capital stock measure or

of a delayed rather than a geometric depreciation curve are still open issues which will require further research[46]. The capital stock excludes investment done during the current year as the latter are generally not productive at that stage.

Two particular problems occur when using the net capital stock figures from the Investment and Capital Stock Division: first, these data are based on the 1970 SIC while the input-output tables are on the 1980 SIC; secondly, these data are estimated for industries including all establishments, not only for the business industries like in the case of input-output tables. Capital assets for industry segments have been estimated, removed from some industry groups and reclassified to others so as to maximize the number of concordant industry classes. Non-business industry capital stock was estimated and removed from the industries where significant sectoring differences were known to exist: namely, in non-metal mines, chemical and chemical products industries, miscellaneous manufacturing industries, railway transport and related service industries, and other utility industries.

The principal difficulty in estimating the price of capital input is that, unlike intermediate commodities, it cannot be observed from market transactions except in the case of leases. The price is therefore imputed on the basis of what the industry would charge itself for using its own capital assets, which is the income generated from capital services: the sum of other operating surplus and net income of unincorporated business net of labour income of self-employed workers. Non-commodity indirect taxes (subsidies) are also added (subtracted) to the capital cost as they are associated with the industry's ownership and use of capital assets. Prices are obtained by dividing the generated income by net capital stock of the previous year in constant prices.

[46] *In Canada U.S. comparisons, one must note that, in the Canadian measure of the capital stock, a more accelerated depreciation pattern is being used. For a more technical description of the new capital asset series, see Fixed Capital Flows and Stocks, Methodology, Investment and Capital Stock Division, Statistics Canada, May 1990.*

APPENDIX 3

Aggregation Parameters for Multifactor Productivity Measures

For the purpose of deriving multifactor productivity growth rates, the inputs in goods and services were taken from the input-output tables at their most disaggregated level[47] (about 600 commodities). However, it was not possible to use the inputs or outputs by industry at their most disaggregated level (154 industries for the business sector at the link level of the input-output tables) mainly because capital stock series were not available for some industries. Input-output tables have been aggregated to a special level of aggregation -- identified as PL -- required for the multifactor productivity measures which consists of 110 business sector industries (excluding Postal Services for which no capital data are available). For analytical purposes, two other aggregation levels were built: 33 industries (level PM) and 13 industries (level PS). These levels were determined to be as close as possible to the M and S levels of industry classification of the input-output tables. It is hoped that further developments of the capital database will eventually allow multifactor productivity estimates to be produced at the M and S levels of the input-output tables and that these developments will extend the PL level closer to the L level.

The industrial coverage of the business sector departs slightly from the current definition of the Canadian System of National Accounts as some components were excluded. These are Postal Services (L 131), Other Utility Industries nec (L 134), and Government Royalties on Natural Resources (L 140), and Owner Occupied Dwellings (industry L 141). Owner Occupied Dwellings and Government Royalties on Natural Resources were considered to be improperly defined industries for productivity analysis while capital stock data were not available for the Postal Service Industry and Other Utility Industries.

Text tables 1 through 3 establish the concordance between the input-output L level and the multifactor productivity database PL, PM and PS levels of aggregation. The concordance for the PM level pertains only to manufacturing industries as industries outside this group are essentially the same as those at the PS level. In a few cases, again because of capital stock data limitations, multifactor productivity estimates refer to a somewhat different group of industries from those regularly published in the labour productivity section: as shown in Text table 3, at the PM level within manufacturing industries, Leather & Allied Products Industries were grouped with Rubber Products Industries, and Clothing Industries were grouped with Primary Textiles & Textile Products Industries.

[47] *Empirically, it was impossible, at this stage, to include a measure of natural resources such as land used as inputs. Natural resources are important mostly for primary industries but play only a minor role in other industries.*

Text table 1

Concordance between the PL aggregation level and the link level of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
1	Agricultural & related services ind.	011-017 021-023	001-021	001-021	1
2	Fishing & trapping industries	031-033	041-047	041-047	2
3	Logging & forestry industries	0411,0412 0511	031,039	031,039	3
4	Metal mines	0611-0617 0619	051-052 057-059	051-059	4-6
5	Non-metal mines	0621,0622- 0625,0629, 063	061,071- 073,079	061,071 073,077 079	7-10
6	Crude petroleum & natural gas	071	064	063-066	11
7	Quarrying, sand pits & mining serv.	081,082 091,092	083,087 096,098 099	083,087 092,099	12-13
8	Meat & poultry products	1011-1012	1011-1012	101,103	14-15
9	Fish products industry	102	102	111	16
10	Fruit and vegetables industries	103	103	112	17
11	Dairy products industries	104	104	105,107	18
12	Feed industry	1053	106	123	19
13	Misc. food products industries	106,109 1051-1052 1081-1083	105 1081-1083 1089	124,125 131,133 135,139	20,23,24
14	Biscuit, bread & other bakery prod.	1071-1072	1071,10721	128,1291	21,22
15	Beverage industries	111-114	1091-1094	141,143 145,147	25-28
16	Tobacco products industries	121,122	151,153	151,153	29
17	Rubber & footwear products ind.	151-159 1712	1623,1624 1629,174	161,163 169,174	30,33
18	Plastic products industries	161-169	1651,27332	27332,3851	31
19	Leather tanneries	1711	172	172	32
20	Misc. leather & allied prod. ind.	1713,1719	179	179	34

Text table 1

Concordance between the PL aggregation level and the link level of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
21	Man-made fibre yarn & woven cloth	181,1829	181,183	183,201	35
22	Wool yarn & woven cloth industry	1821	182	193,197	36
23	Misc. textile products industries	191,193 1991-1995 1999	184,1851 1852,1871 1872,1891- 1894,1899	211-215 218	38-39
24	Carpet, mat & rug industry	192	186	216	40
25	Clothing industries exc. hosiery	183,243- 245,2491- 2493,2495 2499	175,2391 2392,243- 249	175,2391- 2392,242- 249	37,41
26	Hosiery industry	2494	231	231	42
27	Sawmills, planing & shingle mills	251	251	251	43
28	Veneer and plywood industries	252	252	252	44
29	Sash, door & other millwork ind.	254	254	254	45
30	Wooden box & coffin industries	256,258	256,258	256,258	46
31	Other wood industries	259	259	259	47
32	Household furniture industries	261	2619	2619	48
33	Office furniture industries	264	264	264	49
34	Other furniture & fixture ind.	269	269	266	50
35	Pulp & paper industries	271	271	271	51
36	Asphalt roofing industry	272	272	272	52
37	Paper box & bag industries	273	2731,2732 27331	2731,2732 27331	53
38	Other converted paper products ind.	279	274	274	54
39	Printing & publishing industries	281,283 284	286,288 289	286,288 289	55
40	Platemaking, typesetting & bindery	282	282	287,8932	56
41	Primary steel industries	291	291	291	57

Text table 1

Concordance between the PL aggregation level and the link level of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
42	Steel pipe & tube industry	292	292	292	58
43	Iron foundries	294	294	294	59
44	Non-ferrous smelting & refining ind.	295	295	295	60
45	Aluminum rolling casting, extruding	296	296	296	61
46	Copper rolling casting & extruding	297	297	297	62
47	Other metal rolling, casting etc.	299	299	298	63
48	Power boiler & struct. metal ind.	301,302	301,302	301,302	64
49	Ornamental & arch. metal prod. ind.	303	303	303	65
50	Stamped, pressed & coated metals	304	304	304	66
51	Wire and wire products industries	305	305	305	67
52	Hardware, tool & cutlery industries	306	306	306	68
53	Heating equipment industry	307	307	307	69
54	Machine shops industry	308	308	308	70
55	Other metal fabricating industries	309	309	309	71
56	Agriculture implement industry	311	311	311	72
57	Commercial refrigeration equipment	312	316	316	73
58	Other machinery & equipment ind.	319	315	315	74
59	Aircraft & aircraft parts industry	321	321	321	75
60	Motor vehicle industry	323	323	323	76
61	Truck, bus body & trailer industry	324	324	324	77
62	Motor vehicle parts & accessories	325	1652,188 325	2291,325 3852	78
63	Railroad rolling stock industry	326	326	326	79
64	Shipbuilding and repair industry	327	327	327	80
65	Misc. transportation equipment ind.	328,329	328,329	328,329	81

Text table 1

Concordance between the PL aggregation level and the link level of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
66	Small electrical appliance industry	331	331	331	82
67	Major appliances (elec & non-elec.)	332	332	332	83
68	Record players, radio & tv receiver	334	334	334	84
69	Electronic equipment industries	335	335	335	85
70	Office, store & business machines	336	318	318	86
71	Communications, energy wire & cable	338	338	338	87
72	Other elect. & electronic products	333,337 3391-3399	268,333 336,3391 3399	268,336- 337,339	88-89
73	Clay products industry	351	351	351	90
74	Cement industry	352	352	341	91
75	Concrete products industry	354	354	347	92
76	Ready-mix concrete industry	355	355	348	93
77	Glass & glass products industries	356	356	356	94
78	Non-metallic mineral products n.e.c.	357-359	353,357- 359	343,345 352-355 357,359	95
79	Refined petroleum & coal products	361,369	365,369	365,369	96
80	Industrial chemicals industries n.e.c.	371	371	378	97
81	Plastic & synthetic resin industry	373	373	373	98
82	Pharmaceutical & medicine industry	374	374	374	99
83	Paint & varnish industry	375	375	375	100
84	Soap & cleaning compounds industry	376	376	376	101
85	Toilet preparations industry	377	377	377	102
86	Chemical & chemical products n.e.c.	372,379	372,379	371-372 379	103
87	Jewellery & precious metal ind.	392	392	382	104

Text table 1

Concordance between the PL aggregation level and the link level of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
88	Sporting goods & toy industries	393	393	393	105
89	Sign and display industry	397	397	397	106
90	Other manufacturing industries n.e.c.	391,3991- 3994,3999	391,3991- 3994,3999	381,383 384,395 398,399	107-108
91	Construction industries	401-449	404-421	404-421	109-117
92	Air transport & services incidental	451,452	501-502	501-502	118
93	Railway transport & rel. services	453	503	506	119
94	Water transport & rel. services	454,455	504,505	504,505	120
95	Truck and other transport ind.	456,4572- 4575,4589 4592,4599 996,9991	506-508 517,519	507-508 517,519	121,123 125
96	Urban transit system industry	4571	509	509	122
97	Highway & bridge maintenance ind.	4591	516	516	126
98	Pipeline transport industries	461	515	515	127
99	Storage & warehousing industries	471,479	524,527	524-527	128
100	Telecommunication broadcasting ind.	481	543	543	129
101	Telecommunication carriers & other	482,483	544,545	544,545	130
102	Electric power systems industry	491	572	572	132
103	Gas distribution systems industry	492	574	574	133
104	Wholesale trade industries	501-599	602-629	602-629	135
105	Retail trade industries	601-692	10722,2611 631-699	1292,2611 631-699	136
106	Finance, insurance & real est. ind.	701-705 709,711- 729,731- 733,741- 743,7499 7511,7512 759,761	7011-7016 7019,703 705-707 715,7211 7212,735 7371	702,704 7311,7312 735,7371	137-139

Text table 1

Concordance between the PL aggregation level and the link level of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
107	Service industries	771-777 779,911- 914,921 922,961 962,963- 969,971- 973,979 982,983 991-995 9999,4842 4581	841-845 849,851- 855,861- 864,866 867,869 871,872 874,876 877,879 881,886 891-8931 894-899 512	851,853- 859,861 862,864 866,869 871,872 874-879 891,8931 894-899 512	142-144 148-154 124
108	Educational service industries	851-859	801-809	801-809	145
109	Hospitals	861	821	821	146
110	Other health services	8621,863 865,866 8671,8679 868,8691- 8693,8699	822-827	823-827	147

Text table 2

Concordance between the PS aggregation level and the input-output link aggregation level.

PS Level Industries

PS Codes	Industry Title	Link Code	PL Code
1	Agricultural & related services ind.	1	1
2	Fishing & trapping industries	2	2
3	Logging & forestry industries	3	3
4	Mining, quarrying & oil well ind.	4-13	4-7
5	Manufacturing industries	14-108	8-90
6	Construction industries	109-117	91
7	Transportation & storage industries	118-123 125-128	92-99
8	Telecommunication industries	129,130	100-101
9	Electric power & gas dist. ind.	132,133	102,103
10	Wholesale trade industries	135	104
11	Retail trade industries	136	105
12	Finance, insurance & real est. ind.	137-139	106
13	Community, business, person. serv. ind.	124,142-154	107-110

Text table 3

Concordance between the PM aggregation level and the input-output link aggregation level.

PM Level
Manufacturing Industries

PM Codes	Industry Title	Link Code	PL Code
5	Food industries	14-24	8-14
6	Beverage industries	25-28	15
7	Tobacco products industries	29	16
8	Plastic products industries	31	18
9	Rubber, leather & allied prod. ind.	30,32-34	17,19,20
10	Textile, textile products & clothing ind.	35-42	21-26
11	Wood industries	43-47	27-31
12	Furniture & fixture industries	48-50	32-34
13	Paper & allied products industries	51-54	35-38
14	Printing, publishing & allied ind.	55,56	39,40
15	Primary metal industries	57-63	41-47
16	Fabricated metal products industries	64-71	48-55
17	Machinery industries	72-74	56-58
18	Transportation equipment industries	75-81	59-65
19	Electrical & electronic products	82-89	66-72
20	Non-metallic mineral products ind.	90-95	73-78
21	Refined petroleum & coal products	96	79
22	Chemical & chemical products industries	97-103	80-86
23	Other manufacturing industries	104-108	87-90

APPENDIX 4

Quality of Multifactor Productivity Estimates and Related Data

The multifactor productivity estimates presented in this publication are assigned quality ratings in order to provide an overall assessment of their relative quality. Data quality assessment is a subjective process which depends on a large number of factors. One is whether the basic data are obtained from a census or a sample survey. The quality of these sources is affected by factors such as questionnaire design, response rate, editing and the degree of imputation. In the case of survey data, quality is further dependent on sample design and sample size. In addition, some statistical information is derived residually while some other is estimated.

Quality ratings are provided for the last benchmark year as noted on the following tables. Data quality ratings for previous years may be found in preceding issues of this publication; data for the period following the benchmark year are deemed to be of lesser quality although no quality rating is provided.

The quality rating for multifactor productivity at all levels of aggregation relies on the quality rating for gross output, intermediate inputs, capital, and labour, except for that of the business sector which depends on the quality rating for value-added, for capital, and for labour.

Intermediate inputs and gross output in current and constant prices and gross domestic product (GDP) carry the quality ratings described in Appendix A of *The Input-Output Structure of the Canadian Economy*, catalogue number 15-201. Capital input data quality is based on the ratings of business investment as given in the above mentioned publication. The quality ratings of employment, person-hours and labour compensation are discussed in Appendix 4 of Part 1 of this publication.

The quality ratings of basic data at the PS and PM aggregation levels (refer to Appendix 3 for more information on aggregation levels) are obtained by weighting the disaggregated quality ratings using value shares as weights. The quality assessment of multifactor productivity estimates is then based on the combined quality ratings of outputs, labour inputs, capital inputs, and, if applicable, intermediate inputs, according to their respective value shares. Quality ratings of basic data shown in text tables 1 and 2 of this appendix are rounded to the nearest highest rating to account for the quality-increasing effect of aggregation.

Text table 1

Quality ratings for the components of multifactor productivity estimates by industry at aggregation level PS and for the total business sector, 1989

Industry Title	Gross Output		Labour Inputs			Capital Inputs		Intermediate Inputs		GDP		MFP Index	
	C$	K$	C$	Pers.*	Pers. Hrs**	C$	K$	C$	K$	C$	K$	Pers.*	Pers.-Hrs.**
Agricultural & related services ind.	2	2	3	3	3	2	2	2	2	2	2	2	2
Manufacturing industries	1	1	1	2	2	1	2	1	1	1	1	1	1
Construction industries	2	3	2	2	2	2	3	3	3	3	3	3	3
Transportation & storage ind.	1	2	2	2	2	1	2	2	2	2	2	2	2
Telecommunication industries	1	1	1	1	2	2	2	2	2	1	2	2	2
Wholesale trade	1	2	2	2	2	2	2	3	3	3	3	3	3
Retail trade	1	2	2	2	2	2	2	3	3	3	3	3	3
Business sector	...	...	1	1	1	1	2	...	...	1	1	1	1

* Persons at work ** Person-hours worked

Text table 2

Quality ratings of the components of multifactor productivity estimates by manufacturing industry at aggregation Level PM, 1989

Industry Title	Gross Output		Labour Inputs			Capital Inputs		Intermediate Inputs		MFP Index	
	C$	K$	C$	Pers.*	Pers.-Hrs.**	C$	K$	C$	K$	Pers.*	Pers.-Hrs.**
Food industries	1	1	1	1	2	1	2	1	2	1	2
Beverage industries	1	1	1	1	2	1	2	2	2	1	2
Tobacco products industries	1	1	1	1	2	1	2	1	1	1	1
Plastic products industries	1	1	1	3	2	1	2	1	1	1	1
Rubber & leather	1	1	1	2	2	1	2	1	1	1	1
Textile, textile prod. & clothing ind.	1	1	1	2	2	1	2	1	1	1	1
Wood industries	1	1	1	2	2	1	2	1	2	2	2
Furniture & fixture industries	1	1	1	3	2	1	2	1	1	1	1
Paper & allied products industries	1	1	1	1	2	1	2	1	1	1	1
Printing, publishing & allied ind.	1	2	1	3	2	1	2	2	2	2	2
Primary metal industries	1	1	1	1	2	1	3	1	2	1	2
Fabricated metal product industries	1	1	1	3	2	1	3	1	1	1	1
Machinery industries	1	1	1	3	2	1	3	1	1	1	1
Transportation equipment industries	1	1	1	1	2	1	2	1	2	1	1
Electrical & electronic products	1	2	1	2	2	1	2	1	2	2	2
Non-metallic mineral products	1	1	1	2	2	1	2	1	1	1	1
Refined petroleum & coal products	1	1	1	1	2	1	3	1	2	1	2
Chemical & chemical products ind.	1	1	1	1	2	1	3	2	2	2	2
Other manufacturing industries	1	1	1	3	2	1	2	1	1	1	1

* Persons at work ** Person-hours worked

APPENDIX 5

Multifactor Productivity Estimates in CANSIM

	CANSIM Matrices
Indices since 1961	
Gross output productivity based on hours worked	7896
Net-gross output productivity based on hours worked	7897
Value-added productivity based on hours worked	7898
Interindustry productivity based on hours worked	7899
Gross output productivity based on employment	7900
Net-gross output productivity based on employment	7901
Value-added productivity based on employment	7902
Interindustry productivity based on employment	7903

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..	figures not available.
...	figures not appropriate or not applicable.
-	nil or zero.
--	amount too small to be expressed.
p	preliminary figures.
r	revised figures.
x	confidential to meet secrecy requirements of the Statistics Act.

Contributors

This publication was produced under the direction of Claude Simard, Director, René Durand, Assistant Director and Aldo Diaz, Chief of the Productivity Section, Input-Output Division.

Tables, Graphs & Composition: N. Richer, D. Ethier

Data Analysis and Development: J.-P. Maynard, J.-P. Séguin, J. Johnson

Data Processing: J.-P. Séguin, D. Ethier, J.-P. Maynard

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The System of National Accounts

In Canada, the National Accounts have been developed since the close of the Second World War in a series of publications relating to their constituent parts. These have now reached a stage of evolution where they can be termed a "System of National Accounts". For purposes of identification, all publications (containing tables of statistics, descriptions of conceptual frameworks and descriptions of sources and methods) which make up this System carry the term "System of National Accounts" as a general title.

The System of National Accounts in Canada consists of several parts. The annual and quarterly Income and Expenditure Accounts (included with Catalogue Nos. carrying the prefix 13) were, historically speaking, the first set of statistics to be referred to with the title "National Accounts" (National Accounts, Income and Expenditure). The Balance of International Payments data (Catalogue Nos. with prefix 67), are also part of the System of National Accounts and they, in fact, pre-date the Income and Expenditure Accounts.

Greatly expanded structural detail on industries and on goods and services is portrayed in the Input-Output Tables of the System (Catalogue Nos. with prefix 15). The Catalogue Nos. carrying the prefix 15 also provide measures of the contribution of each industry to total Gross Domestic Product at factor cost as well as Productivity Measures.

Both the Input-Output tables and estimates of Gross Domestic Product by industry use the establishment as the primary unit of industrial production. Measures of financial transactions are provided by the Financial Flow Accounts (Catalogue Nos. with prefix 13). Types of lenders and financial instruments are the primary detail in these statistics and the legal entity is the main unit of classification of transactors. Balance sheets of outstanding assets and liabilities are published annually.

The System of National Accounts provides an overall conceptually integrated framework in which the various parts can be considered as interrelated sub-systems. At present, direct comparisons amongst those parts which use the establishment as the basic unit and those which use the legal entity can be carried out only at highly aggregated levels of data. However, Statistics Canada is continuing research on enterprise-company-establishment relationships; it may eventually be feasible to reclassify the data which are on one basis (say the establishment basis) to correspond to the units employed on another (the company or the enterprise basis).

In its broad outline, the Canadian System of National Accounts bears a close relationship to the international standard as described in the United Nations publication: A System of National Accounts (Studies in Methods, Series F, No. 2 Rev. 3, Statistical Office, Department of Economic and Social Affairs, United Nations, New York, 1968).

Table of Contents

PART 2

Introduction

This issue of *Aggregate Productivity Measures* introduces a number of changes to the presentation of the estimates. Multifactor productivity indices, being a more comprehensive measure of productive efficiency, are now published in the first section of the publication, followed by labour productivity and related data in the second section. The change in the order of presentation is intended to provide a new perspective to users of this publication, conveying the notion that overall, or multifactor, productivity measures are a superior alternative relative to labour productivity as indicators of overall productive efficiency. This, of course, does not detract from the usefulness of labour productivity as a partial productivity indicator. It simply points out that labour productivity, like other partial productivity ratios that can be calculated, reflect not only the productivity of the work force but also the effect of other factors, such as the capital intensity of production. Its use as an overall efficiency indicator should be made only after acknowledging the influence of these other factors.

Multifactor productivity, labour productivity and related data now incorporate revisions due to completion of 1989 final and 1990 preliminary input-output benchmark tables, as well as consequent revisions to 1989-1992 compensation and real GDP data.

The multifactor productivity estimates now include two new industries, for a total of 112 business sector industries. These new industries are disaggregations of previously existing ones. The Rubber and Footwear Industry was split into the Rubber Products Industry and the Footwear Industry. Similarly, the Clothing Industries excluding Hosiery now excludes the Broad Knitted Fabric Industry which is shown separately. The industry breakdown was made in order to have as many industries in the multifactor productivity database as in the Input-Output tables. As a result, and for the manufacturing industries only, the aggregation level PM in multifactor productivity now agrees with aggregation level M in the Input-Output tables. In addition to these, some other changes were made. The Labour Productivity estimates now includes a breakdown of the Wholesale and Retail Trade Industries into its two components, the Wholesale Trade Industry and the Retail Trade Industry.

Because labour and multifactor productivity share many common elements, appendices describing definitions, sources of data, data quality, aggregation parameters and Cansim matrix numbers that appeared separately for labour and for multifactor productivity indices in previous publications are now combined. The new presentation facilitates comparisons between the estimates, eliminates duplication and it shortens the publication.

Besides the Highlights section which appears in every issue of this publication, this issue also includes two feature articles. One describes the new KLEMS database which has been developed in order to facilitate analytical uses of the multifactor productivity database. Although the database itself in not part of the feature article, it is made available to users on a cost recovery basis. At the most disaggregated level, the data includes current price and constant price KLEMS inputs and output for 112 business sector industries as well as implicit input prices. These statistics are also aggregated to the PS and PM levels of aggregation (see Appendix 3 for details of aggregation levels and correspondence between levels).

The choice of five input categories in the KLEMS database (capital, labour, energy, materials and services) can be useful, for instance, to the analysis of factor intensity of production, the estimation of partial productivity ratios and the analysis of the contribution of production factors to output growth. The second feature article illustrates some possible uses of this database by looking at the Canadian manufacturing industry during the period between 1961 and 1990. The article uncovers important changes in the manufacturing industries that took place during this 30 year period as well as during each of the three decades separately.

The indices of multifactor productivity presented in Part I are calculated under two alternative activity concepts: industry productivity and interindustry productivity. The estimates of industry productivity are produced under alternative output concepts while the concept of output used in the interindustry measure is industry gross output. The output concepts used in industry productivity are gross output, net-gross output and value-added (the reader may consult Appendix 1 for definitions of these concepts). However, not all output concepts are used at all levels of aggregation. For example, at the most disaggegated level and at the PM and PS levels of aggregation, multifactor productivity is calculated on gross output and net-gross output. Business sector multifactor productivity is calculated only for value-added output while manufacturing productivity is calculated based on the three output concepts.

FOR FURTHER READING
Selected publications from Statistics Canada

The labour and multifactor productivity indexes presented in this publication are obtained mainly from a set of integrated industry and commodity statistics within the System of National Accounts (SNA). The integration ensures consistency of definition over time and across industry and commodity classifications and the information may therefore differ from other Statistics Canada data. Publications with a catalogue number prefix 15 contain SNA integrated data and are available under the following titles:

- Gross Domestic Product by Industry, cat. 15-001.
- The Input-Output Structure of the Canadian Economy, cat. 15-201.
- The Input-Output Structure of the Canadian Economy in Constant Prices, cat. 15-202.
- The Input-Output Structure of the Canadian Economy, 1961-81, cat. 15-510, occasional.
- The Input-Output Structure of the Canadian Economy in Constant Prices, 1961-81, cat. 15-511, occasional.

Highlights

The concerns we raised last year about relative trends in productivity and unit labour cost in Canada and the United States remain despite a net improvement in this area. In 1992, productivity improved in Canada with the start of the economic recovery. Reinforced by reduced wage inflation, this improvement in productivity led to a substantial slow-down in unit labour cost growth. Moreover, revisions made to U.S. data also contributed to improve Canada's relative position. Nevertheless, a reduction in the exchange rate was the principal cause in an improved competitive position of Canada relative to the United States.

The following paragraphs examine these recent trends within the framework of the last decade for the Canadian business sector and manufacturing industries successively.

1 - Business Sector

1.1 - Highlights for 1991 and 1992

According to revised estimates, business sector multifactor productivity improved in 1992, showing a 0.4% gain. Even if modest, it was the first gain since 1987. This favorable upturn coincident with a minor recovery in economic activity, has been mainly achieved through a drop of 1.0% in the labour input.

Furthermore, labour productivity (real GDP per hour worked) increased from 1.7% in 1991 to 2.1% in 1992, while inflation in hourly compensation declined significantly from 5.1% to 3.8%. This increase in labour productivity and decline in hourly compensation contributed to a substantial decline in the growth of unit labour costs from 3.4% in 1991 to 1.7% in 1992. The growth rate of unit labour cost continued on a downward trend that began in 1989, reaching the lowest growth rate since 1984, when it increased by 1.5%.

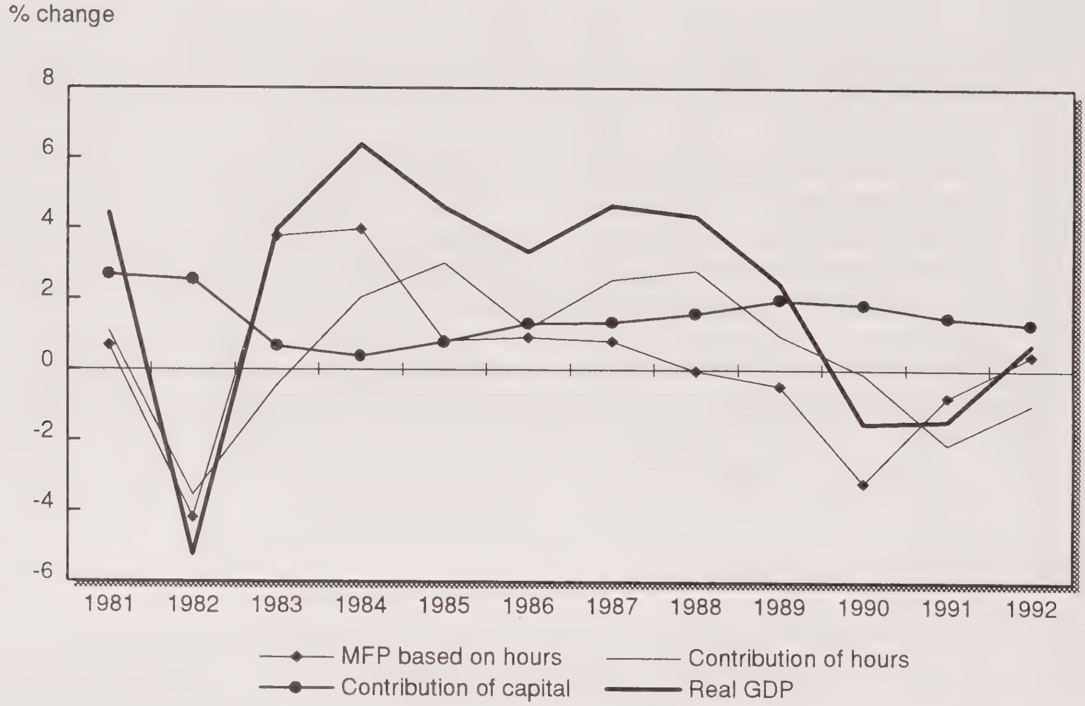
1.2 - Trends During the 1982-1992 Period

Taking a long run perspective, figure 1 traces the sources of growth (capital, labour and multifactor productivity) of the business sector real value added over the course of the last 11 years. During that period, output grew by 30.5% with labour contributing one third towards this growth, and capital and productivity contributing respectively 45% and 22%.

However, the contribution of productivity to output growth was partially hidden by important cyclical fluctuations over that period as output grew short of its potential. While the fluctuations in hours worked were synchronized with those of real GDP, the cyclical movement of the capital stock exhibited a lag of about one year compared to real GDP. The continuous increase in capital during the trough and slow-down in GDP growth had a negative impact on the measure of multifactor productivity during this period which would be reversed if the recovery were to gain strength and output were to come closer to its potential.

Figure 1

Sources of the growth in business sector real GDP, 1981-1992



1.3 - Canada-United States Comparison of Labour Productivity and Unit Labour Cost[1]

When expressed in their own currencies, the growth of unit labour cost in Canada was identical, at 1.7%, to that in the U.S. in 1992. This result comes from better U.S. productivity performance (3.3%) relative to Canada (2.1%) and from milder wage inflation in Canada (3.8%) than in the U.S. (5.1%).

However, in order to analyze the competitiveness of Canadian products on foreign markets, it is more appropriate to examine unit labour cost in a common currency because it takes into account variations in relative currency values[2]. The 5.2% depreciation of the Canadian dollar in relation to the U.S. in 1992 resulted in the first improvement of the competitiveness of the Canadian business sector in the North American market since 1986. Indeed, expressed in U.S. dollars, unit labour costs in the Canadian business sector declined 3.6% while its U.S. counterpart increased 1.7%.

1. *As in recent years, the highlights intend to compare the relative performance of Canada with that of the United States. Unfortunately, this comparison remains limited to labour productivity data; the Americans have not yet completed the in-depth revisions to their multifactor productivity estimates. U.S. data are published by the Bureau of Labor Statistics.*

2. *A measure based on the purchasing power parity of industries' gross outputs would be preferable but, unfortunately, it is only available for final demand at this time.*

The 1992 improvement occurred after five annual increases in the unit labour cost of Canadian products relative to that of U.S. products. During that period, the gap between these rates of increase in costs varied between 7.3% in 1987 and 1.5% in 1991, reaching a peak of 10.3% in 1988.

Figure 2

Annual growth in business sector unit labour cost in Canada and the United States, 1981-1992

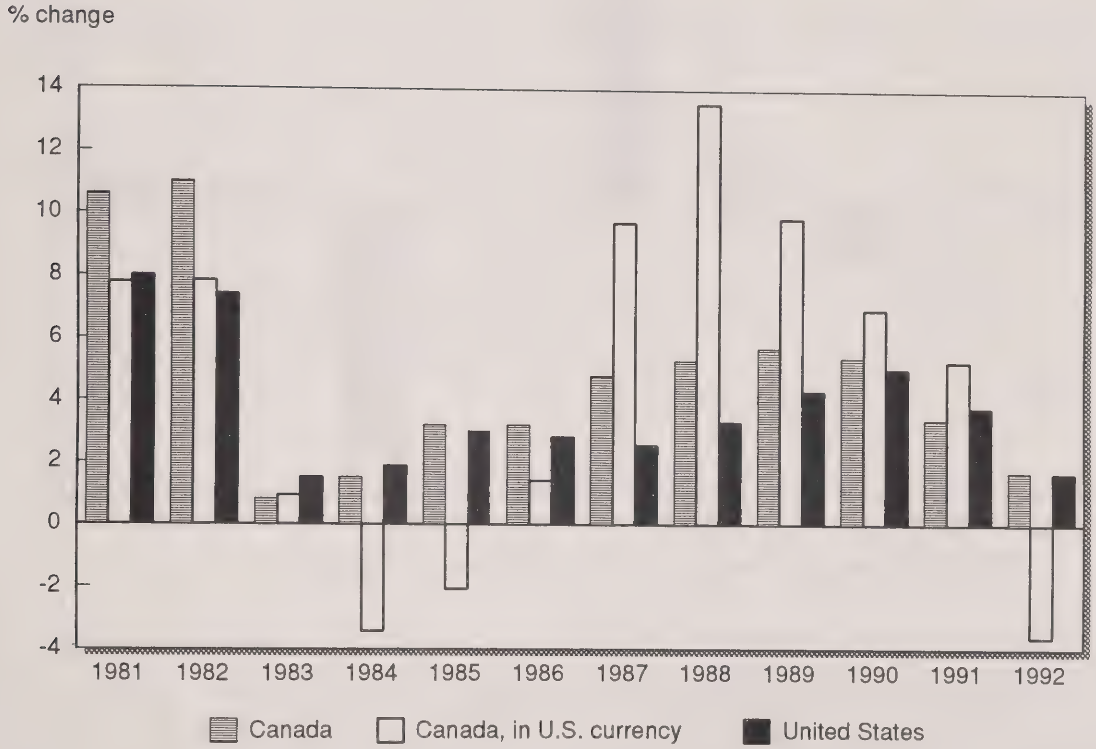
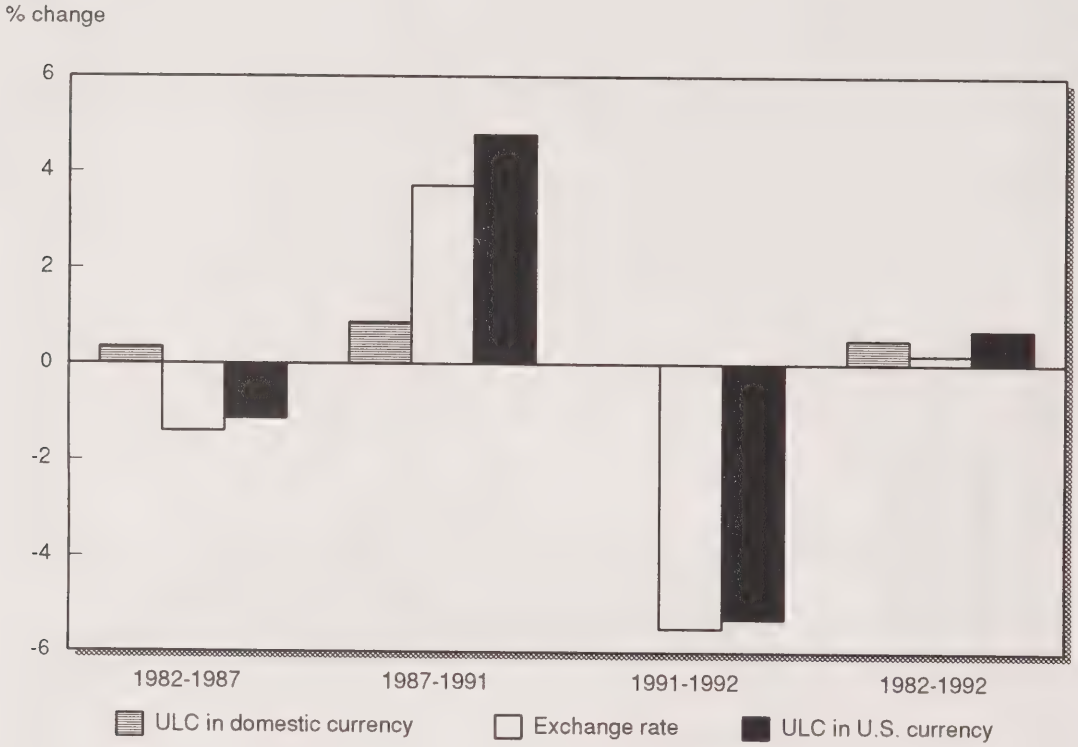


Figure 3 shows the differences between the growth of unit labour costs of Canada and United States over the period 1982-1992 in domestic and U.S. currency. This time frame has been divided into three periods marked by the two turning points in relative unit labour cost in 1987 and 1992. It appears from the figure that fluctuations in the exchange rate during each of these periods were the main, if not the only, factor influencing the gap between the unit labour costs of Canada and the United States.

It is interesting to note that, during the period spanning 1982-1992, labour productivity increased at 1.5% annual rate in both countries. The annual growth in unit labour costs was slightly higher in Canada by 0.7%. To a large extent, wage rates determined the relative evolution of unit labour costs between the two countries, given that the 1992 exchange rate was close to the 1982 rate. Hence, even though the variations in the exchange rate had only a minor impact over the longer term, they have been a dominant factor in the relative unit labour costs between Canada and the U.S. over the short term.

Figure 3

Differences in the growth of business sector unit labour cost between Canada and the United States



As can be seen in Figure 4, in addition to the recession that has also affected the United States, the relative rise in unit labour costs appears to have had a negative impact on Canadian exports to the U.S. The share of canadian exports in GDP gradually increased on average by 8.1% per year between 1982 and 1985, declined by 3.5% annually between 1986 and 1991 and grew by 11.5% in 1992. Given that 75% of Canadian exports are shipped to the U.S., this decline in exports to the U.S. implied a slow-down in the foreign demand for Canadian products between 1986 and 1991.

2 - Manufacturing Industries

2.1 - Highlights for 1991 and 1992

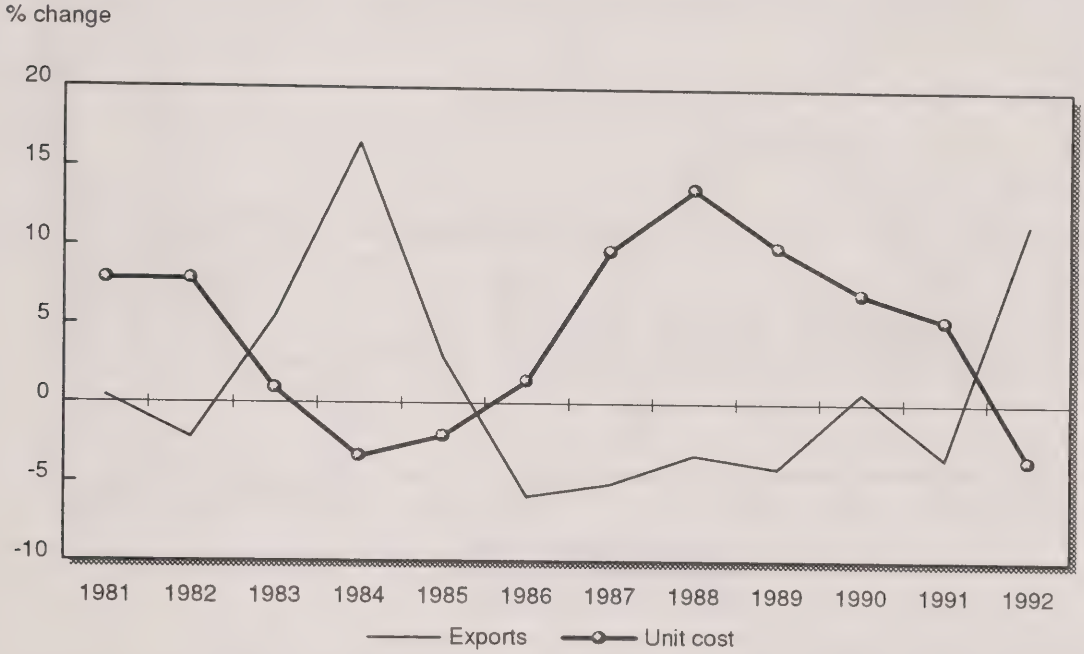
Multifactor productivity increased 1.6% in 1992 after declining 2.8% in 1991. The 1992 productivity gain was due mainly to a rationalization of inputs, which declined 1.4% while output increased 0.2%. Despite this recovery, the level of productivity in 1992 was only slightly above the 1983 level.

Similar to the business sector, there were favorable changes in labour productivity and wage inflation in manufacturing industries in 1992. Labour productivity increased 3.8% in 1992, a substantial improvement over the 1.5% gain recorded in 1991 and the largest since 1984. In the same vein, the 6.6% increase in hourly compensation in 1991 subsided somewhat in 1992 to

5.1%. Supplementary labour income accounted for 35% of the increase in wage inflation in 1992, even though it represented only 14% of labour compensation.

Figure 4

Annual percentage change in merchandise exports to the U.S. as a percentage of GDP and Canadian unit labour cost in U.S. currency, 1981-1992



2.2 - Trends During 1982-1992 Period

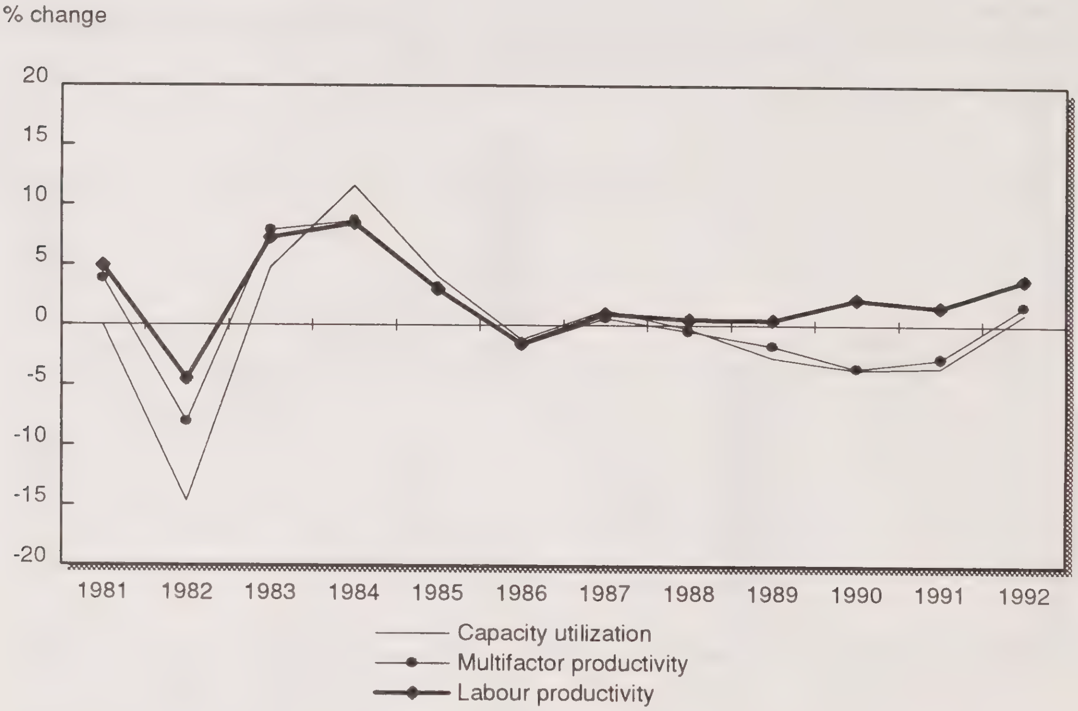
The analysis of multifactor productivity estimates for the manufacturing industries tend to confirm the fact that Canada began to feel the effect of a strong slow-down in the demand for its products beginning in 1986-1987. Indeed, multifactor productivity in these industries declined for the first time in 1986, increased slightly in 1987 (0.6%) and then declined for four consecutive years before advancing 1.6% in 1992.

As figure 5 demonstrates, the indicator of industrial capacity utilization shows that the productivity decline observed since 1986 coincides with significant underutilization of productive capacity. This figure also shows that the multifactor productivity measure remains particularly sensitive to economic cycles, more so than that of labour productivity. This occurs despite the correction to capital input, made solely for changes in capacity utilization. The slow-down in machinery and equipment investment observed after 1989 suggests a slower growth for the capital stock in the next few years and a recovery in multifactor productivity. This can already be observed from the upturn of productivity in 1992.

This phenomenon is due to the different behaviour of labour and capital in the short term. The cyclical variation in labour productivity are less pronounced simply because the labour input is relatively less fixed over the short run than capital. It follows that labour productivity did not decline except in 1986, that it increased slightly between 1987 and 1989 and that it increased at a rate resembling its long term rate after the beginning of the 1990 recession.

Figure 5

Annual growth in multifactor productivity, labour productivity and in the rate of utilization of industrial capacity - manufacturing industries, 1981-1992



It is interesting to compare the performance of the manufacturing industries during the last recession with that of the 1982 recession. After growing by 4.3% in 1981, real GDP declined by 5.6% in 1982. This abrupt reduction in a short period of time led to the sharp decline in the two productivity measures, as companies did not have sufficient time to adjust their inputs. In contrast, the more recent output decline was much more gradual, allowing manufacturing companies enough time to reduce their labour inputs in proportion to the reduction in their output. The adjustment on the side of capital needs was delayed but began to appear in the early 1990s.

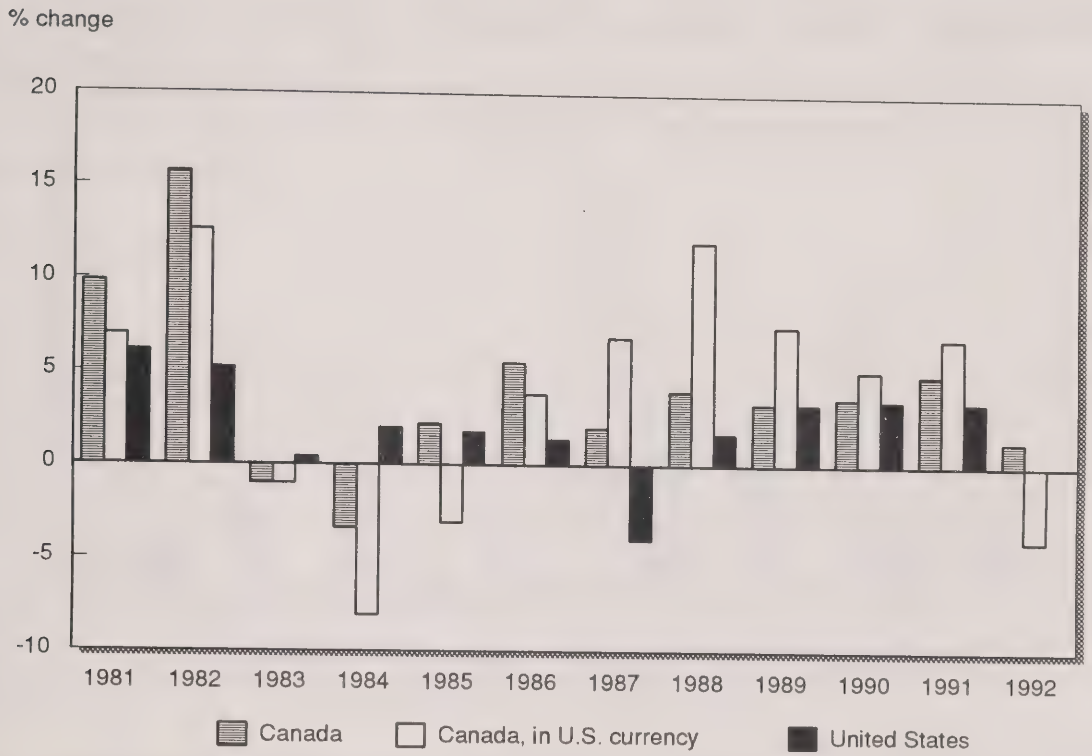
2.3 - Canada-United States Comparison of Labour Productivity and in Unit Labour Cost

Due to the depreciation of the Canadian dollar in 1992, manufacturing businesses improved their unit labour costs in relation to those of the United States. Indeed, the unit labour cost index calculated in U.S. dollars decreased by 4 percentage points in Canada while remaining unchanged in the U.S. However, measured in own currency, Canadian unit costs showed an increase of 1.2%.

The stability of unit labour cost in the United States stemmed from more favorable changes in U.S. productivity and labour income. Labour productivity growth while strong at 3.8% in Canada, still fell short of that in the U.S. at 4.3%. Similarly, although Canadian average hourly compensation slowed down to 5.1% in 1992, it increased only 4.4% achieved south of the border.

Figure 6

Annual growth in manufacturing unit labour cost in Canada and the United States, 1981-1992



As in the business sector, the improvement in unit labour cost for manufacturing industries in Canada relative to the U.S. was a welcome relief after six years of deterioration of the competitive capacity of Canadian manufacturers. During the 1986-1991 period, a unit labour costs gap developed in favor of the U.S., growing approximately 4.0% a year.

3 - Conclusion

Given that the manufacturing industries contributed about 55% of business sector multifactor productivity growth, it is not surprising to find that aggregate productivity evolved in a similar fashion to manufacturing productivity during the last 10 years. Thus, the decline in manufacturing productivity that was first discernible in 1986, only became clear with a one year lag at the aggregate business sector level. The latter reached a peak in 1986, slowed down slightly in 1987, before declining over the next four years between 1988 and 1991. Similarly, the progress made in manufacturing industries in 1992 contributed to the overall business sector multifactor productivity gains.

Figure 7

Contribution of labour, capital and multifactor productivity to the growth of real GDP, business sector, 1961-1992

The 1982-1992 period has been characterized by two important recessions, an abrupt but short-lived slow-down in GDP in 1986 and substantial volatility in the exchange rate with respect to the U.S. currency. All these fluctuations forced businesses to continually adjust their production levels and this likely had a negative impact on their degree of technical efficiency. Figure 7 demonstrates this reduction in technical efficiency by showing a 50% reduction in the annual average growth rate of multifactor productivity during the 1982-1992 period in relation to an annual average growth of 1.0% observed during the 1961-1992 period. Furthermore, one can observe that real GDP growth, after 1975, was 45% below its average growth between the years 1961-1975. This relatively low growth in production was accompanied by a retraction in multifactor productivity.

FEATURE ARTICLE 1

A KLEMS Database: Describing the Input Structure of Canadian Industry

by Joanne Johnson[1]

1 - Introduction

Industrial restructuring, globalized trade, capital intensity, labour hoarding, energy crises, technological advance; these are terms commonly used in newspapers, business seminars, and political debates. They share the common theme of describing industry: how it works, the shocks it sustains, how it adapts to a changing environment. All of these terms are related to the question: What is the make-up of the industrial sector? This question falls naturally into two parts: What does the business sector produce? And what does the business sector use?

This paper describes the KLEMS database - industry data on total output, total input, and major categories of inputs: capital (K), labour (L), energy (E), material (M) and service (S) - that is being offered to illustrate what the business sector uses. Information on industries' output and inputs according to these broad categories affords the opportunity for analysing many attributes of business' input make-up and efficiency in the use of those inputs.

The KLEMS database is useful because it enables users to manipulate a manageable amount of data which covers the range of costs faced by businesses. The Input-Output tables provide detailed commodity information, which is useful for gaining an understanding of the inputs and outputs for individual industries, but is too detailed to permit an evaluation of industry structure through time or across industries with relative ease. Similarly, summary capital and labour input estimates, while certainly less cumbersome to deal with, account for less than half of businesses costs. Intermediate input costs make up the bulk of businesses costs. While the types of intermediate inputs are quite varied, they can be classified into three relatively homogeneous groups: energy, materials and services. This affords one the opportunity to work with a reasonably small amount of data, while still preserving many of the distinctive features of these inputs.

This database permits in-depth answers to questions on the structure and adaptation of industry. For example, do increases in capital primarily result in decreases in labour, or are they more often energy saving? Similarly, increased globalized trade, and the corresponding reduction in tariffs and quotas, begs the question of how the make-up of inputs have changed: have reductions in tariffs on U.S. steel led to the substitution of imported steel for Canadian workers? How do industries adapt to relative price changes, both in the short run and in the long run, such as those of the energy crises in 1973 and 1979 and the drastic fall in energy prices in 1986? To

1. *I would like to thank all members of the Productivity Section who assisted in this study. I would especially like to thank Aldo Diaz and René Durand for their extensive assistance, and Jean-Pierre Maynard, Erik Poole and Jody Proctor for their helpful comments. Finally, I would like to thank Nicole Richer for her extensive time and help in the preparation of this article.*

answer these questions and gain a complete understanding of the input structure of Canadian industry one must ask: How much, in terms of quantity and value, is being used of various types of inputs and how have the relative prices of these inputs changed through time?

In addition to providing a better basic understanding of use of inputs by industry, information on critical inputs would permit a more sophisticated analysis of the efficiency of that use. Multifactor productivity (MFP) estimates are useful for analysing the performance of industry as a whole, but they do not provide insight on the underlying growth in inputs associated with changes in MFP. Data on energy, materials and service inputs would permit analysis of productivity growth similar to that in the U.S. For example, Norsworthy[2] has suggested that slower capital formation has been responsible for a slowdown in productivity from 1973 to 1981 in the U.S. Jorgenson[3] also asserts that higher material prices tend to be associated with increases in productivity growth, but high energy prices lead to productivity decline and were responsible for the slowdown. However, Olson[4] has pointed out that energy cost shares are very small and not likely to account for a large portion of the slowdown. Thus, in order to determine the forces that affect productivity, a richer set of data pertaining to the production function - one that includes energy, materials and service inputs - is necessary.

Another major asset of this database is that it enables a better understanding of labour productivity estimates. Labour productivity estimates, which are valuable for determining how much is produced by workers in Canada, can be misleading if the user is not fully cognizant of the fact that this ratio may increase for a variety of reasons completely unrelated to workers' abilities and efforts. Partial productivity estimates for each category of inputs would provide an indication of some of the causes of changes in labour productivity, i.e. changes in the use of capital, energy, materials or services in production. Thus, partial productivity estimates by broad input categories afford the opportunity for a better understanding of labour productivity and MFP estimates.

The purpose of this paper is to describe how the KLEMS database is generated and what is available to users. Section 1 describes data sources and input commodity classifications. Section 2 explains the various types of estimates available (ie. quantity, price and productivity estimates generated according to the Törnqvist, Laspeyres, Paasche and Fisher index formulas). Section 3 reviews the industry coverage and the differences in the treatment of industries that users should be aware of. Finally, some potential uses of the KLEMS database are cited.

2 - Data Sources

The KLEMS database is derived entirely from the multifactor productivity database. Conceptually, the two databases are the same; output values represent the amount paid to firms and thus include subsidies but exclude taxes, while input costs represent the full cost - including all applicable taxes and subsidies - of using each commodity. All input and output values are given in both current and constant prices. The only difference between the two databases is that the productivity database includes detailed commodity data (602 commodities prior to 1987 and

2. *Norsworthy, et. al., "The Slowdown in Productivity Growth." Brookings Papers on Economic Activity. 1979:2.*

3. *Jorgenson, D. W., "Energy Prices and Productivity Growth." Productivity Prospects for Growth. J. M. (ed.) New York: Von Nostrand Reinhold, 1981.*

4. *Olson, M., "The Productivity Slowdown, the Oil Shocks and the Real Cycle." Journal of Economic Perspectives. Fall, 1988.*

485 thereafter), whereas in the KLEMS database, output commodities are combined into one series and input commodities are grouped into five broad categories.

The current price productivity database is derived from the current price Input-Output tables, which delineate the inputs used and outputs sold by each industry. These values are generated by combining elements of the Input-Output tables to calculate the full cost (including all taxes and subsidies for inputs and subsidies only for outputs) of each of the commodities[5]. Readers should note that the current price capital input (as derived from the Input-Output tables) is an estimation based on what the industry would charge itself for using its own capital assets. This is assumed to be the income generated from those capital services, which is the residual income after paying for all other input costs. For further details on how this transformation is performed refer to the appendices at the back of this publication.

The second type of values in the productivity database, the constant price values, serve as estimates of the quantities, since they are calculated as the value of commodities, after removing the effects of nominal price changes. The constant price values of intermediate inputs and all outputs are taken from the Input-Output tables, as in the case of current price values. However, the quantity estimates for capital and labour input are derived from other sources. The constant price values of capital input are derived from data on capital stock owned by industries. In contrast to the measurement of output and other inputs, labour hours are used as quantity estimates rather than constant price values. Labour hours are derived from a combination of surveys[6]. Once again, the sources and manipulation of the data are explained in greater detail in the appendices in this publication.

The KLEMS database is generated from this productivity database. The first component of the KLEMS, gross output, is produced by aggregating all output commodities. The next two components, capital and labour inputs, are single elements in the productivity database, and are taken as such. The last three categories, the intermediate inputs, are generated by combining elements of the productivity database into three groups.

Intermediate commodities are allocated among three classifications of inputs: energy, materials, and services. Energy commodities are fuel and electricity consumed by the establishment for energy purposes only. Any fuel purchased as an input material or for any other non-energy purpose is included in the materials category. In general, material inputs are commodities that can be held in inventory by the producer, while service inputs correspond to actions performed by producers. For example, a producer can hold an inventory of ingots, but can not hold an inventory of laundry, cleaning and pressing services; it can only perform the service of cleaning and pressing the laundry. For an explicit mapping of commodities to categories, refer to the appendix of this article.

5. *The Input-Output tables are available at both producer and purchaser prices. Producer prices are the prices received by the sellers at the boundary of their establishment. Purchaser prices correspond to the market price at the point of delivery. This market price valuation includes two components in addition to the price of the commodity bought: taxes and margins. Margins are payments for other real services, such as retail, wholesale and transportation services that were distinct from the purchased commodity. Given that these margins are distinct from the commodity, the producer price values are used to generate the MFP database*

6. *For a detailed description of how the estimates of hours worked were generated, refer to Jean-Pierre Maynard, "Multifactor Productivity based on Hours Worked" Aggregate Productivity Measures, second 1991 edition, Catalogue 15-204E., pp. 39-49.*

3 - Calculation of the Estimates

The KLEMS database contains four series of estimates for each industry: current price values, volume indices, price indices and productivity indices.

The *current price values* for each of the categories are calculated by summing the current price values for all the commodities of each category.

Volume indices are estimates of the growth in the quantities of some group of commodities. In order to satisfy the needs of various users, the KLEMS data are presently generated using four different formulas for calculating a volume index: the Törnqvist, the Laspeyres, the Paasche and the Fisher Ideal. Each of these formulas are presented in the box to the right.[7]

The Törnqvist volume index is generated in several steps. First, the growth of each commodity within each component of the KLEMS is calculated. Second, these growth rates are weighted according to each commodity's average value share within that component, and summed together. Third, these estimates of the quantitative growth of each component are transformed into indices with base year values set equal to one hundred.

The Laspeyres volume index is calculated by dividing the value of all inputs used in the current year, measured in the previous years prices, by the value of inputs in the previous year, also measured in the previous years prices. On the other hand, the Paasche index is generated by calculating the value of goods in the current and previous year in the current years' prices. The Fisher Ideal index is simply a geometric average of the two.

QUANTITY INDICES

The Tornqvist volume index is a geometric weighted average of the ratios of the current and previous year's quantities

$$T_Q = \prod_{i=1}^{n} (Q_{1i}/Q_{0i})^{wi}$$

which can also be expressed as

$$ln(T_Q) = \sum_{i=1}^{n} w_i * ln(Q_{1i}/Q_{0i})$$

where i *= commodities* 1 *through* n

w_i *= average value shares at time* 0 *and* 1

The Laspeyres volume index is an index of the growth in quantities valued in the previous year's prices

$$L_Q = \frac{\sum_{i=1}^{n} (P_{0i}Q_{1i})}{\sum_{i=1}^{n} (P_{0i}Q_{0i})}$$

The Paasche volume index is an index of the growth in quantities valued in the current year's prices

$$P_Q = \frac{\sum_{i=1}^{n} (P_{1i}Q_{1i})}{\sum_{i=1}^{n} (P_{1i}Q_{0i})}$$

The Fisher Ideal volume index is a geometric mean of the Paasche and Laspeyres indexes

$$F_Q = (L_Q * P_Q)^{1/2}$$

PRICE INDICES

Value, volume and price indexes are related by the identity

$$V_1/V_0 = \frac{P_1}{P_0} * \frac{Q_1}{Q_0}$$

Hence, all price indexes are implicitly defined as

$$P_1/P_0 = \frac{V_1}{V_0(Q_1/Q_0)}$$

7. *For a description of the properties of index numbers, see W. E. Diewert, Index Numbers, The Palgrave Dictionary of Economics, John Eatwell, et. al. (edt.) London: The MacMillan Press Limited, 1987. pp. 766-779.*

The Törnqvist index formula has been used in the MFP estimates. One of the most attractive features of the Törnqvist formula is that it corresponds exactly to the translog production function, which is a general functional form (i.e. it does not require any restrictive assumptions about factor shares, whereas the Laspeyres and Paasche do).

All volume indices are calculated in a bottom-up fashion; they are initially estimated at the most disaggregated industry level, then weighted according to their contribution to the aggregated industry, and finally summed together[8].

All the *price indices* are derived implicitly from the volume indices and the current price values. To begin, an estimate of the constant price value of each component is computed. This is arrived at by multiplying the base year current price value by the volume index. This produces an estimate of the annual quantities in base year prices. The price indices are subsequently derived by dividing current price values by the constant price values.

The price of capital services is peculiar in the sense that it is a residual ex post (after the fact) price - rather than an ex ante (before the fact) price. Hence, the volume of capital services are assumed to be proportional to the stock of capital given by the net-end-of-previous-year capital stock, valued in constant prices. The value of capital services, on the other hand is assumed to be equal to the residual income generated from capital services. Prices are obtained by dividing current price values by constant price values; thus, the price of capital is the generated income, divided by the real capital stock.

Output/input ratios, or *partial productivity* estimates, are also available for total inputs and each of the five input categories. These are ratios of the output volume index to the input volume index for each input category, or, equivalently, the difference between the growth of output and the growth of each category of inputs.

4 - Industry Coverage and Differences

The KLEMS data are available at the same three levels of industrial aggregation as the MFP estimates: the PS level (13 industries), the PM level (35 industries) and the PL level (112 industries). The KLEMS inputs are the inputs used by all the establishments in each industry; thus, the value of total inputs in current prices sums to the value of gross outputs in current prices.

The concept and/or the method of calculation of inputs and gross output is quite different for some service industries. For most industries, gross output is equal to the value of sales of goods and services *produced*, corrected for changes in inventories, plus any wholesale or retail margins earned on goods purchased for resale. These margins account for the better part of gross output in wholesale and retail trade (and to a lesser extent community business and personal services) industries, but only a small portion in other industries. Hence, while for most industries gross output and total sales corrected for inventory changes are very close, large margins imply a

8. *Note that the Tornqvist index, as it is a geometric average, will vary if calculated in a different number of stages. Thus, the single stage Tornqvist of all inputs will not equal exactly the two stage Tornqvist of all inputs, calculated by weighting the Tornqvist indices for each of the five categories of inputs. This difference, however, is marginal. For a discussion of this topic, see W. E. Diewert, Superlative Index Numbers and Consistency in Aggregation, Econometrica, Vol. 46, No. 4 (July 1978).*

concept of gross output in wholesale and retail trade industries which is closer to value added. Thus, readers should use caution when comparing these industries to others.

Gross output and inputs are also calculated differently in the financial industries. Operating surplus for all industries, except for financial industries, refers only to operating revenue. Thus, capital gains and interest earned on investments are not included in this surplus, but interest paid on borrowing is included as an expense. However, this treatment of interest payments and earnings is inappropriate for financial institutions as the interest differential is a primary source of income for these industries[9]. Hence, for financial industries, interest paid is removed as an expense, and interest earned, net of interest paid, is included in revenues received. Consequently, readers must be careful when comparing these industries to other industries that would be less affected by developments in the financial sector.

The final industries that undergo special treatment are the construction industries. All other industries are comprised of establishments engaging primarily in the same or similar types of activities[10]. However, for the Input-Output definition of the construction industry, construction activity is separated from all industries and transferred to the construction industry. Construction estimates further differ from other estimates in that gross output is calculated net of intra-industry sales. Therefore, the estimates for construction industries correspond only to inter-industry and final demand construction sales. In consequence, these measures are not subject to changes in the vertical integration of establishments within the industry as are those of other industries.

Readers should note that the exact concept of output has significant implications for productivity estimates. The measure of MFP in the KLEMS - gross output productivity - is estimated as the growth of gross outputs minus the growth of all inputs. In this case, the more firms buy inputs from other establishments, the more they push upstream the productivity gains associated with the production of their output. Hence, productivity gains of establishments are associated with production processes they cover. The larger this coverage (the less establishments buy from other establishments) the greater the productivity gains that accrue to them[11].

5 - Some Applications Using the KLEMS Database

The KLEMS data are suitable for examining a wide variety of issues. The KLEMS database is useful for demonstrating the typical costs faced by firms. For example, one can discern that over 50% of manufacturing costs are material input costs, and almost one quarter are attributable to labour. One can also see how various shocks affect the costs faced by firms. For example, continuing increases in the price of energy have pushed the share of energy costs up from 1.6% in the 1960s to 1.7% in the 1970s and 2.3% in the 1980s.

One can also use the KLEMS data to break down the changing value of inputs into quantity and price effects. For example, we can see that the constant price value of capital inputs has grown

9. For a detail explanation of how the input-output estimates are calculated for the service industries, see Service Industries in the Canadian Input-Output Accounts, Statistics Canada, catalogue 15-601, No. 2.

10. For a detailed explanation of how industries are classified, see the Standard Industrial Classification, 1980, Statistics Canada, catalogue 12-501.

11. For more details on the sensitivity of productivity measures to output, see Aldo Diaz, "Alternative Concepts of Output and Productivity", Aggregate Productivity Measures, 1989, Catalogue 15-204, pp. 97-106, and Ren- Durand, "Aggregation, Integration and Productivity Analysis: An Overall Framework", Aggregate Productivity Measures, 1989, Catalogue 15-204, pp. 107- 118.

at more than twice the rate of labour inputs, while the price of labour has grown at almost double the rate of capital. We can use the estimates of quantity and price growth rates to estimate substituting effects among inputs.

We can also use the KLEMS to gain some insight on the growth of inputs. Productivity growth implies that firms are becoming more efficient at using their inputs. Hence, the growth of each type of input can grow slower relative to output. Recalling that intermediate inputs are themselves outputs of other firms, productivity growth also implies that intermediate inputs can be offered at lower prices in times of strong productivity growth. This leads to a fall in their prices relative to the price of labour, and thus, may induce a substitution effect.

Changing levels of vertical integration in producing any given output are also evident from the KLEMS data. Thus, we may find that labour and capital inputs grow slower than output even in times of slow productivity growth, as firms continually specialize their production process.

The KLEMS data also enable one to estimate the correlation of the growth of each input with respect to productivity growth. This affords the opportunity to relate changes in productivity growth to changes in the input make-up of firms.

6 - Conclusion

This article has presented a description of the KLEMS database that is now available to users, as well as some potential uses and limitations that users should be aware of. The database contains industry data on total output, total input and each of the five input categories. The data cover the entire 1961 to 1990 time frame and will be updated annually following the release of the MFP data.

Price, quantity, value and partial productivity estimates are available at three industrial aggregation levels. User can choose estimates generated according to any of the four index formulas: the Törnqvist, the Laspeyres, the Paasche or the Fisher Ideal. The alternative indices, calculated according to these formulas, offer the user a great deal of flexibility in choosing the measures they require.

Given that the KLEMS database is generated from the database used to produce the MFP numbers, the two databases are conceptually the same. Inputs and outputs are thus valued in a fashion which is most appropriate for production analysis. Hence, the KLEMS database is suitable for analysing a wide range of issues in any business sector industry.

APPENDIX

The following table presents the commodity classifications for the energy, material and service input categories. In general, material inputs are commodities that could be held in inventory by the producer, while services are actions performed by a producer. Energy inputs are commodities such as fuel and electricity consumed by the establishment for energy purposes only.

For most industries, energy commodities are used only as a source of energy. However, in some manufacturing industries, certain energy commodities such as coal, natural gas and heavy fuel oil may be used as material inputs, rather than as a source of energy. Thus, in order to generate a KLEMS database based on use of inputs, energy commodities are allocated to either energy or material use.

The input-output commodity estimates for manufacturing industries are derived from the annual Census of Manufacturers survey. The use of energy commodities is identified on this questionnaire, and thus, is used to estimate the its use as a material or energy input. This allocation is performed in two stages. First, for the 1972 to 1990 period, the detailed responses to this survey are used to calculate the value of fuels used as energy, versus material inputs. This proportion is then applied to the input-output estimate for each energy commodity.

For the 1961 to 1971 period, the detailed responses to the Census of Manufacturers survey are not available. However, estimates for total energy commodities devoted to energy use, and total material commodities, by industry, are available from this survey. This information can be used to estimate the total energy and total material use of energy commodities. This was accomplished by calculating the total value of energy commodities from the input-output tables. Then, the proportion of inputs used for energy purposes (from the Census of Manufacturers survey) was applied to this total input-output estimate. This energy use estimate was then subtracted from the input-output total to arrive at an estimate of the total material inputs. The non-energy material commodities are then subtracted from this estimate of material inputs. Thus, what remains is the total energy use of all energy commodities and the total material use of all energy commodities. This provides the breakdown for both types of use for energy inputs. The total use of each energy commodity is provided by the input-output estimate of energy inputs. With these two pieces of information, it is possible to make a reliable estimate of the proportion between energy and material use of each energy commodity.

Use of fuel

	e_1	m_1	t_1
	e_2	m_2	t_2
Commodity type	. .	. .	. .
	T_e	T_m	T

This estimate was arrived at by setting up the following matrix, where the row totals (total energy use for each commodity, from the input-output tables) and the column totals (use of total fuels as energy or material inputs, from the Census of Manufacturing Survey) are known. The breakdown of use by commodity was estimated by first putting in the known proportions of energy and

material use from 1972 and 1973. Then each of the cells were recalculated such that the proportion that each commodity contributes to each type of use remained constant, but they summed to the column (use) totals. Then, the cells were recalculated such that the proportionate use of each commodity was maintained, but that these uses summed to the row (commodity) totals. This process was repeated iteratively (25 times) to arrive at a final estimate of the energy and material use of each energy commodity.

Readers will note that repair construction input commodities are classified as services, as opposed to material commodities. This is because when a firm purchases repair construction, it is purchasing the services of those in the construction industry, to fix something they own. The firm is not purchasing an existing structure held in inventory by the producer.

Historical Link Commodities (485 level)[12]

Energy Commodities

31 Coal
33 Natural gas
322 Gasoline
323 Diesel & fuel oil, aviation fuel
326 Other liquid petroleum gases
430 Electric power
432 Coke

Material Commodities

1 Cattle & calves
2 Hogs
3 Poultry
4 Other live animals
5 Wheat, unmilled
6 Corn, barley, other grains
7 Fluid milk, unprocessed
8 Eggs in the shell
9 Honey & beeswax
10 Fresh fruit, excl tropical
11 Vegetables, fresh or chilled
12 Hay & straw
13 Seeds, excl oil seeds
14 Nursery stock, etc
15 Soybeans, canola & oth oil seeds
16 Raw tobacco
17 Mink skins, ranch undressed
18 Raw wool
19 Serv incidental to agric. & forestry
20 Logs, poles, pilings, bolts, etc
21 Pulpwood
22 Fuelwood & other crude wood
23 Custom forestry
24 Fish & seafood, fresh, chilled
25 Hunting & trapping products
26 Gold & alloys in primary forms
27 Radioactive ores & concentrates
28 Iron ores & concentrates
29 Bauxite & alumina
30 Other metal ores & concentrates
31 Coal
32 Crude mineral oils
33 Natural gas
34 Sulphur, crude & refined
35 Asbestos, crude & milled
36 Gypsum
37 Salt
38 Peat
39 Clays
40 Natural abrasives & indust. diamonds
41 Oher crude minerals
42 Sand (excl silica) & gravel
43 Stone, crude
44 Services incidental to mining
45 Meat, fresh, chilled, frozen
46 Cured meat
47 Prepared meat products
48 Animal fat & lard
49 Margarine & shortening
50 Sausage casings
51 Feeds from animal by products
52 Raw animal hides & skins
53 Animal by products for industrial use
54 Custom work, meat & food
55 Poultry, fresh, chilled, frozen
56 Milk & other dairy products
57 Fresh cream
58 Butter
59 Cheese
60 Ice cream
61 Mayonnaise, salad dressing & mustard
62 Fish products
63 Fruit & products, frozen, preserved
64 Fruit & jam in airtight cont.
65 Vegetables, frozen, preserved
66 Vegetables & juice, in airtigh cont.
67 Soups in airtight containers
68 Infant & junior foods, canned
69 Sauces, pickles, etc
70 Vinegar
71 Pre-cooked & frozen products, etc
72 Feed supplements and premixes
73 Complete feeds
74 Feeds from grain by products
75 Feeds from vegetable by product
76 Pet feeds
77 Wheat flour
78 Starches
79 Breakfast cereal products
80 Biscuits
81 Plain bread & rolls
82 Other bakery products
83 Cocoa & chocolate
84 Nuts
85 Confectionery
86 Sugar
87 Oil-cake feeds
88 Crude vegetable oils
89 Nitrogen function compounds
90 Other flours & processed grain
91 Maple sugar, syrup & oth syrup

12 *The Historical Link Commodity Coding Structure is used to Reconciliate the 1961-1987 (602) and 1987-1990 (627) Commodity Code Classifications*

92 Prepared cake & other mixes
93 Dehydrated soup mixes & bases
94 Roasted coffee
95 Tea
96 Potato chips & flakes
97 Other food preparations & ice
98 Soft drink concentrates
99 Carbonated soft drinks
100 Distilled alc. beverages,incl coolers
101 Beer, incl coolers
102 Wine, incl coolers
103 Unmanufactured tobacco
104 Cigarettes
105 Other tobacco products
106 Waterproof footwear
107 Passenger car tires
108 Truck, bus & off-highway tires
109 Other tires, tubes & repair material
110 Conveyor & transmission belting
111 Other rubber products
112 Hose & tubing, mainly rubber
113 Plastic containers & closures
114 Other plastic products
115 Leather & misc leather goods
116 Footwear, excl waterproof
117 Leather gloves
118 Luggage
119 Handbags, wallets, etc
120 Cotton yarn
121 Cotton woven fabric
122 Tire cord fabric
123 Bedding, towels & cloths
124 Wool & wool mix yarn & thread
125 Wool & wool mix woven fabric
126 Felt
127 Man-made staple fibres
128 Polyamide resins, incl nylon
129 Yarn, filament & staple fibres
130 Tire yarn
131 Fabrics, excl cotton
132 Cotton thread
133 Man-made thread
134 Rope & twine
135 Narrow fabrics, incl lace
136 Textile floor covering
137 Textile dyeing & finishing serv
138 Awnings, tarpaulins, etc
139 Tents, sleeping bags, sails etc
140 Other household textile products
141 Other textile products
142 Hosiery
143 Knitted fabrics
144 Knitted clothing
145 Clothing, excl knitted
146 Dressed furs
147 Fur apparel, incl artificial
148 Custom tailoring
149 Wood chips
150 Lumber, treated wood
151 Wood waste
152 Custom wood work & millwork
153 Plywood & veneer
154 Wood const. prod.,excl prefab. build
155 Wood prefabricated buildings
156 Wood containers
157 Caskets & coffins
158 Other wood products
159 Household furniture
160 Office furniture
161 Commercial, instit. & oth furniture
162 Portable lighting fixtures
163 Pulp
164 Newsprint paper
165 Other paper
166 Tissue & sanitary paper stock
167 Wrapping & sack paper
168 Paper board, incl boxboard
169 Building board & asphalt build prod
170 Paper & textile hygiene prod
171 Vanillin
172 Paper waste & scrap
173 Vinyl floor & wall covering
174 Paper bags, boxes, plastic bags
175 Coated paper prod. incl wallpaper
176 Backed aluminum foil
177 Paper containers for commercial use
178 Stationery & photographic paper
179 Paper end products, incl household
180 Newspapers, magazines & periodicals
181 Books, greeting cards, maps, etc
182 Banknotes, cheques, stamps, et
183 Other printed matter
184 Advertising in print media
185 Specialized publishing service
186 Printing plates, type, etc
187 Ferro-alloys
188 Iron & steel ingots, billets, etc
189 Steel castings
190 Steel bars & rods
191 Flat iron&steel,incl galv,tinplate
192 Iron&steel railway const. material
193 Tar & pitch
194 Carbon & graphite products
195 Oil & gas casing & drill pipe
196 Oil & gas line pipe
197 Other iron & steel pipes & tubes
198 Other cast iron products
199 Iron & steel pipe fittings
200 Nickel in primary forms
201 Copper primary forms
202 Lead in primary forms
203 Zinc in primary forms
204 Aluminum in primary forms
205 Tin in primary forms & fabric. mat.

206 Precious met. in prim.forms excld gold
207 Other non-ferrous base metals
208 Other inorg. bases & metal. oxides
209 Metal scrap
210 Aluminum & alum.alloy fabricated mat.
211 Copper fabricated materials
212 Copper alloy fabricated materials
213 Lead & lead alloy fabricated mat.
214 Nickel & nickel alloy fabricated mat.
215 Zinc & zinc alloy fabricated mat.
216 Soldering rods & wire
217 Fabricated steel plate
218 Tanks
219 Power boilers
220 Iron & steel structural materials
221 Prefab. metal bldgs & structures
222 Other metal building products
223 Flat iron & steel, alloy, oth coated
224 Corrugated metal culvert pipe
225 Iron & steel stampings
226 Metal roofing, siding, ducts, etc
227 Metal containers & closures
228 Iron & steel wire & cable
229 Iron & steel wire fencing & screen
230 Chain, excl motor veh. & power trans.
231 Welding rods & wire electrodes
232 Kitchen utensils & wire products
233 Hardware
234 Machine tools & accessories
235 Hand & measuring tools
236 Scissors, razor blades, ind.cutl., etc
237 Hhold equip. excl range. microw. refrig.
238 Other heating equipment
239 Non-elect. furnaces & heat equip
240 Oil & gas burners, etc
241 Commercial cooking equipment
242 Custom metal working
243 Iron & steel forgings
244 Valves
245 Plumbing fixtures & fittings
246 Gas & water meters
247 Fire fight. & traffic contr. equip
248 Control panels, regulators, etc
249 Firearms & military hardware
250 Bulldozers, farm & garden tractors
251 Other agricultural machinery
252 Bearings & power trans. equip
253 Pumps, compressors & blowers
254 Conveyors, elevators & hoist. mach.
255 Ind. trucks & mat. handlings equip
256 Fans & air circ. units, not indust,
257 Pkg., air pur. & oth gen.purp. mach.
258 Industrial furnaces, kilns & ovens
259 Industry specific machinery
260 Power driven hand tools
261 Refrigeration & air cond. equip
262 Scales & balances
263 Vending machines
264 Computers,office mach.excl photo & fax
265 Aircraft
266 Aircraft engines
267 Aircraft parts & equipment
268 Aircraft services & repairs
269 Automobiles, incl vans
270 Trucks, road tractors & chassis
271 Buses & chassis
272 Motor homes,motorcycles,off-hwy veh.
273 Mobile homes
274 Trailers & semi-trailers
275 Truck & bus bodies
276 Motor vehicle engines & parts
277 Motor vehicle electric equip
278 Other motor vehicle parts
279 Locomotive & railway rolling stock
280 Urban transit rolling stock
281 Parts for rlwy&u.trans. rollin
282 Ships, boats & parts, excl pleasure
283 Ship repairs
284 Snowmobiles
285 Pleasure & sporting craft
286 Small hhold appliances, incl microwave
287 Electric furnace&oth elect.heat equip
288 Household refrigerators & freezers
289 Hhold cooking equip, excl microwave
290 Radio, TV, stereo,VCR & unrec. tape
291 Telephone & rel. equip, incl facsimile
292 Broadcasting & radio comm. equip
293 Radar & radio navigation equip
294 Electronic equipment components
295 Electronic alarm & signal syst
296 Welding machinery & equipment
297 Power gen.&marine prop.eq.,elect. moto
298 Transformers, ballast & converters
299 Industrial electric equipment
300 Batteries
301 Wire & cable, insulated, excl alum.
302 Aluminum wire & cable
303 Wiring materials & electrical meters
304 Lighting fixtures, bulbs & tubes
305 Cement
306 Lime
307 Concrete products, incl sand & lime
308 Ready-mix concrete
309 Bricks & other clay bldg. products
310 Porcelain insulators
311 Ceramic household products
312 Refractory products
313 Natural stone building products
314 Gypsum building products
315 Mineral wool building products
316 Asbestos products
317 Other non-met. mineral basic prod.
318 Glass & other glass products
319 Gass containers

320 Mirror & glass household produts
321 Abrasive products
322 Gasoline
323 Diesel & fuel oil, aviation fuel
324 Lubricating oils & greases
325 Benzene, toluene & xylene
326 Other liquid petroleum gases
327 Naphtha
328 Asphalt & products
329 Petrochemical feed stock
330 Fertilizers, excl nitrogenous
331 Polymers
332 Cellulosic plastic film & sheet
333 Monoethylene glycol
334 Pharmaceuticals
335 Paints & related products
336 Refined vegetable oils
337 Oral care products
338 Soaps, detergents & oth cleaning prod
339 Other industrial chemical prep.
340 Pers. care prod.,bleach,fabric soft.
341 Chlorine
342 Oxygen
343 Phosphorous
344 Other chemical elements
345 Sulphuric acid
346 Other inorg. acids & oxygen comp.
347 Ammonia
348 Caustic soda
349 Sodium chlorate
350 Sodium phosphates
351 Sodium carbonate
352 Oher metallic salts & peroxysalts
353 Other inorganic chemicals
354 Ethylene
355 Butylenes
356 Butadiene
357 Styrene
358 Vinyl chloride
359 Other hydrocarbons & derivatives
360 Methyl alcohol
361 Other alcohols & derivatives
362 Others, alcohol peroxides, etc
363 Other phenols, aldehydes & ket
364 Organic acids & derivatives
365 Organic-inorganic compounds
366 Other organic chemicals
367 Titanium dioxide
368 Carbon
369 Pigments & dyes
370 Nitrogenous fertilizers
371 Synthetic rubber
372 Antifreezing preparations
373 Additives & automobile chemicals
374 Rubber & plastic compounding agents
375 Explosives & non-military ammo.
376 Military ammo. & ordinance
377 Crude vegetable materials & extracts
378 Insecticides & herbicides
379 Adhesives
380 Catalysts
381 Metal working industrial chemicals
382 Printing & other inks
383 Polish, cream & wax products
384 Other oils, fats & waxes
385 Aircraft&naut.navig.instr.,excl radio
386 Scient., measuring & medical instr.
387 Industrial safety equipment
388 Watches, clocks, etc
389 Photographic & photocopy equip & film
390 Jewelry, metal tableware, etc
391 Brooms, brushes, mops, etc
392 Bicycles, baby carriages & strollers
393 Recreational equipment
394 Toys & games, incl electronic
395 Impregnated & coated fabrics
396 Floor & wall covering, excl vinyl
397 Advertising goods
398 Shades & blinds
399 Fur dressing & dyeing services
400 Custom work, miscellaneous
401 Animal hair, feathers, etc
402 Other metal end products
403 Sewing needs
404 Recordings, musical instr.&art. supply
405 Art & decor. goods, misc end prod
430 Electric power
432 Coke
433 Water, waste disp. & other utilities
464 Spare parts & maint.suppl. mach. & equip
465 Office supplies
466 Cafeteria supplies
468 Laboratory equipment & supplies
471 Raw cotton
472 Natural rubber & gums
473 Raw sugar
474 Cocoa beans
475 Coffee, not roasted
476 Tropical fruit

Service Commodities

406 Repair construction
407 Residential construction
408 Non-residential building construction
409 Road, highway & airport construction
410 Gas & oil facility construction
411 Dams & irrigation projects
412 Railway & telecommunications const.
413 Other engineering construction
414 Air transportation
415 School bus & other transport
416 Other serv incidental to transport

417	Water transportation
418	Serv incidental to water transort
419	Railway transportation
420	Truck transportation
421	Bus transport, interurban & rural
422	Urban transit
423	Taxicab transportation
424	Pipeline transportation
425	Highway and bridge maintenance
426	Storage
427	Radio & television broadcasting
428	Telephone & other telecommunications
429	Postal services
431	Gas distribution
434	Wholesaling margins
435	Repair service for mach & equip
436	Rental of office equipment
437	Retailing margins
438	Imputed service, banks
439	Other finance & real estate services
440	Insurance & workers' compensation
442	Cash residential rent
443	Other rent
445	Education services
446	Hospital services
447	Other health & social services
448	Motion picture prod., dist. & exhibit.
449	Other recreational services
450	Professional serv to bus. management
451	Advertising services
452	Laundry, cleaning & pressing services
453	Accommodation services
454	Food services
455	Serv margin on alcoholic beverages
456	Personal services, incl childcare
457	Photographic services
458	Services to buildings & dwellings
459	Computer services
460	Other services to business & persons
461	Rental of automobiles & trucks
462	Trade association dues
463	Rental, oth mach & equip incl const.
467	Transportation margins
469	Travelling and entertainment
470	Advertising & promotion

FEATURE ARTICLE 2

Analysing Canadian Manufacturing Using the KLEMS

by Joanne Johnson[1]

1 - Introduction

Industrial restructuring has become a common place phrase in recent literature. It refers to the organization of business; their input make-up, the business size, and the range of their production processes. This paper utilizes the KLEMS database (industry data on total output, and capital, labour, energy, material and service inputs) to examine how the structure of manufacturing industries has changed over the past thirty years, as plants have adapted their input mix in response to various short run shocks and long run trends[2].

More specifically, we will attempt to illustrate the typical costs faced by establishments engaged in manufacturing. We will also discuss the real growth of output, productivity and each of the inputs, and demonstrate the inter-relation between fluctuating output growth, varying rates of technological progress, and changing relative prices, with respect to the quantitative growth of each of the inputs. In addition to discussing the use and change therein of each of the inputs, we will attempt to give the reader a picture of the nature of the inputs - fixed versus variable - used by establishments. The final element to the discussion of change and adaptation is the homogeneity of these phenomena among manufacturing industries.

2 - Input Value Shares

Material inputs dominated input costs, accounting for slightly more than half of all manufacturing costs during the 1961 to 1990 period, as Figure 1 illustrates. Labour input costs, at almost 23% were the next largest contributor. Service and capital inputs each accounted for approximately one eighth of total costs, while energy inputs made up the smallest proportion at less than two percent.

Material shares, while highest among all input shares in all but one of the 21 Canadian manufacturing industries, varied considerably among industries, ranging from a high of 77% in the refined petroleum and coal products industries to a low of 29.2% in the printing, publishing and allied industries. Similarly, labour shares stretched across a broad spectrum, reaching as

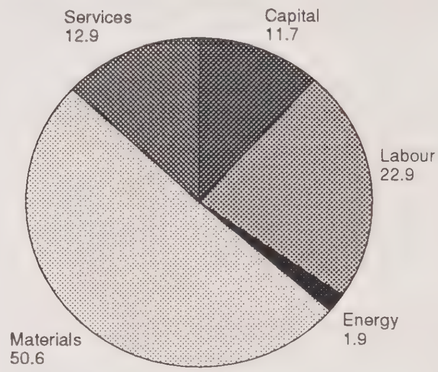
1. *I would like to thank all members of the Productivity Section who assisted in this study. I would especially like to thank Aldo Diaz and René Durand for their extensive assistance, and Jean-Pierre Maynard, Erik Poole and Jody Proctor for their helpful comments. Finally, I would like to thank Nicole Richer for her extensive time and help in the preparation of this article.*

2. *The KLEMS database is described in detail in J. Johnson, "A KLEMS Database: Describing the Input Structure of Canadian Industry" in this publication, p. 19. The article will use the quantity, price and partial productivity estimates derived using the Törnqvist index formula.*

high as 39.0% in the printing, publishing and allied industries and as low as 5.6% in the refined petroleum and coal products industries. Capital shares varied much less among industries, extending between 26.9% (beverage industries) and 4.8% (refined petroleum and coal products industries). Service shares were constrained across a narrow band of 17.9% to 10.9% in the chemical and chemical products and food industries, respectively. Finally, energy shares were the most consistent of all input shares among industries, reaching a meagre high of just 5.9% in the paper and allied products industries and a low of 0.5% in the tobacco products industries[3].

Figure 1

Average input value shares for manufacturing industries over 1961-1990



3 - Three Decades of Growth: the 60s, the 70s and the 80s

While these value shares serve as a first step towards gaining a general picture of these industries, they mask real changes in economic activity. In order to see these real changes, we must examine the quantitative growth of output, productivity and inputs. The box on next page describes a simple production function that relates output growth to productivity and input growth, and an identity relating output values to input values, which serve as the basis for analysing manufacturing industries.

3.1 - Output Growth

Manufacturing industries achieved their strongest output growth rate of the last three decades in the 1960s, an average annual compound rate of 6.0%. Growth slowed considerably in the 1970s to 3.5% and was weakest in the 1980s at 1.8%. Throughout the entire period, output growth averaged 3.7%

The strongest decade for output growth, the 1960s, was also the period of mildest inflation, where prices crawled upward at an annual rate of 1.9%. In contrast, the 1970s were marked by extremely rapid inflation, as output prices bounded ahead at an average annual rate of 9.5%. Output inflation subsided considerably in the 1980s, falling by more than half to just 4.5% annually.

To facilitate comparisons of input and output growth rates across decades, Figure 2 illustrates the quantitative growth rates of output, productivity and each of the inputs in the 1960s, 1970s and 1980s, while both the quantity and price growth rates are presented in Table 1.

3. Energy uses refer only to energy purchased. Energy shares may be biased downward in some industries which, like the pulp and paper and aluminum industries, produce part of the electricity they use. Own account energy use is not recorded as such but rather appears distributed in the cost of inputs used for its production.

Analytical Framework

In this simple model, firms' output (Q) is dependent upon the inputs they use (K, L, E, M, S) and the technology available to them (t), as illustrated in the following equation:

$$Q = f(K, L, E, M, S; t)$$

Output growth may be satisfied by additional use of inputs or more efficient production processes. The latter effect, productivity growth, cannot be observed directly. However, we can reasonably hypothesize that output growth that is not attributable to input growth must be a result of increased efficiency in the use of those inputs, and hence *productivity growth* may be determined residually as the growth of output not accounted for by the growth of all inputs.[1]

The value of output is equal to the value of all inputs, as expressed in the following identity:

$$PQ = r_k K + wL + p_e E + p_m M + p_s S$$

where P, r_k, w, p_e, p_m, p_s are the prices of output, capital, labour, energy, materials and services, respectively. This equality allows us to calculate the value of capital services, $r_k K$ residually as the difference between the value of output and other inputs. This is an intuitively appealing measure of capital services as it is the income generated from using that capital.[2]

This identity has strong implications for relative input and output prices. In the case in which productivity growth occurs, the same volume of output can be produced with fewer resources. Given the above identity, this implies that the same amount of revenue is distributed among fewer inputs, and hence, input prices rise relative to output prices. Thus, one can measure productivity growth as the growth of output quantities minus the growth of input quantities, or as the growth of input prices less the growth of output prices. This means that inflation in input prices is partly absorbed by productivity gains.

Substitution effects are also of major importance in this analytical framework. These effects refer to the substitution of one input for another, in response to a relative price change. Given that other factors which have an impact on the use of inputs are continually changing, we cannot exactly measure this effect. However, we can infer it by measuring the changes in prices and quantities relative to the average for all inputs. This does not imply that a rise in the relative price of an input is the sole cause of a reduction in its use; these may both be the result of a third factor: technological progress. This is particularly likely to be true in the case of labour. Labour saving technological progress may reduce the need for additional labour units while increasing the marginal product of labour and consequently its wage rate. Hence, these numbers suggest only correlation, not causation.

Finally, the present model enables us to generate a measure of *upstream vertical integration*. Upstream vertical integration refers to the span of production processes that a given firm is involved in,

1. *Note that inaccurate measures of either output or input growth lead to biased productivity estimates. This problem is quite serious for the natural resource industries where it is unlikely that all inputs are accurately measured. Measuring real growth in certain service industries may also be problematic, as it is difficult to distinguish between price and quantity increases in their output values. Conversely, these problems are relatively minor in industries such as manufacturing, as the natural resources they use are typically purchased from other establishments, and thus have a market value, while deflation is less problematic given that their outputs are quantifiable goods.*
2. *Once again, as in the case of productivity estimates, incorrect measures of inputs or outputs will lead to biased estimates of capital services.*

with respect to its output. The more processes it covers, the more upstream vertically integrated it is. Alternatively, the more intermediate inputs it purchases from other firms, the less upstream vertically integrated it is. Thus, it reflects a decision on the part of the company to purchase an input rather than produce it itself. We can measure upstream vertical integration as the amount spent on production within the establishment (the amount spent on capital and labour), as a share of total input costs[3].

Output growth, productivity growth, upstream vertical integration, and substitution effects; these are the measures that we use to analyze absolute and relative input growth. These phenomena, while affected by other independent factors, are inter-related. For example, output growth may affect productivity growth by increasing the intensity of economic activity, and subsequently stimulate establishments to strive for greater productivity gains.

While productivity growth reduces the growth of all inputs necessary for attaining a certain output growth rate, it may affect these differentially if substitution effects are brought about. To see this, recall that productivity growth, the excess of output growth over input growth, must be matched by a rise in input prices relative to output prices. Recognizing that intermediate inputs are outputs of other establishments, and are thus subject to these productivity gains and downward pressure on prices, relative input to output price increases must generally, and over the long run, accrue to primary inputs. As a result of this rise in primary input prices, firms are likely to conserve on them and use more intermediate inputs. Hence, productivity gains should lead to increasing use of intermediate inputs and rising returns to primary inputs, although some substitution also occurs among intermediate or primary inputs. As a result of these effects, productivity growth may or may not change input shares. It is said to be neutral when input shares remain constant.

If substitution effects are strong enough, they may encourage establishments to spend relatively more on purchasing outputs of other establishments; hence, they may change the level of upstream vertical integration. Clearly, in this case productivity growth would not be neutral.

In summary then, output growth has positive impacts, *ceteris paribus*, on the use of all inputs. Productivity growth, on the other hand, reduces the need for any given input. However, productivity growth raises the relative price of primary inputs and thus, through substitution effects typically increases the quantitative growth of intermediate inputs. To the extent that these substitution effects are neutral or not, they may also affect the integration of industries.

Finally, it must be acknowledged that while output growth, productivity growth, changing relative prices and upstream vertical integration are inter-related, they are also affected by other factors. Output growth is affected by the degree of international trade, productivity growth is affected by expenditures on research and development, relative prices are affected by supply and demand conditions, and the degree of vertical integration is affected by factors such as the desire on the part of firms to monopolize inputs. Consequently, there are elements of endogeneity and exogeneity in each of these phenomena.

3. Upstream vertical integration refers only to the production process supplying that industry. Downstream vertical integration refers to the activities that bring an establishment's product closer to final demand. It can be measured as the ratio of final sales to total sales. Composite vertical integration refers to the combination of the terms. As estimates of downstream vertical integration, and hence, composite vertical integration, require final demand estimates, they are beyond the scope of the KLEMS database, and thus are not presented here.

Figure 2

Average annual percentage growth of manufacturing output, inputs and productivity over the last three decades

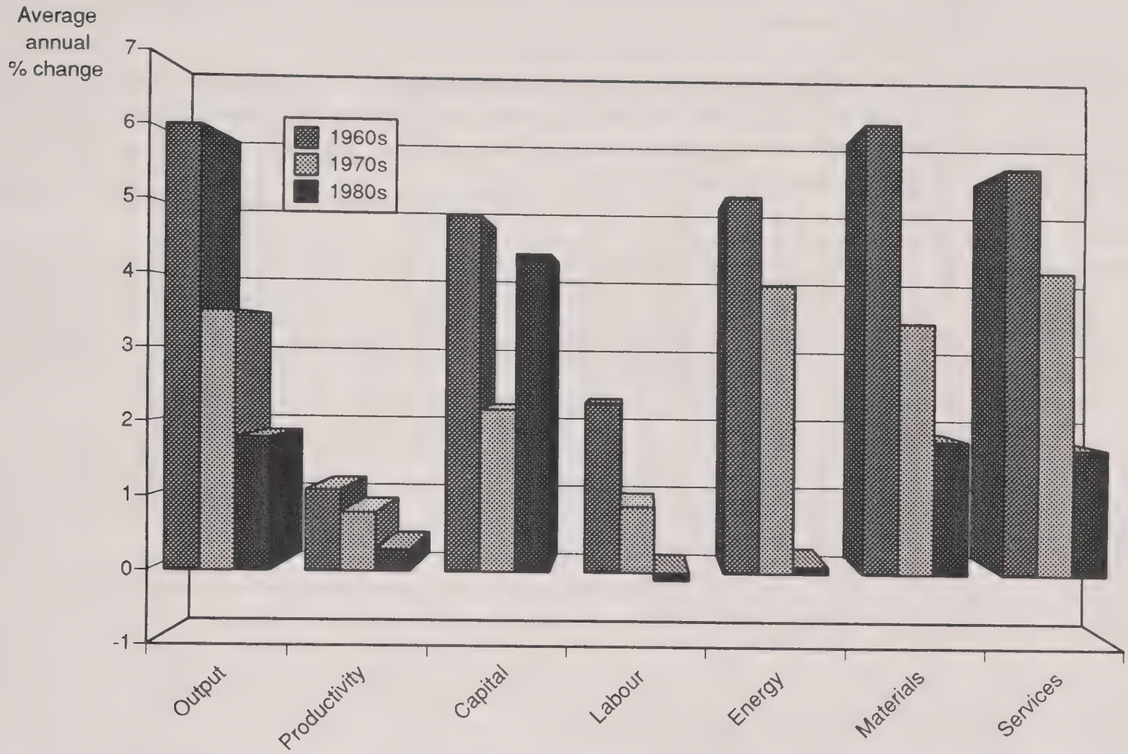


Table 1

Average Annual % Change of Quantities and Prices in Manufacturing

	1960s		1970s		1980s	
	Quantities	Prices	Quantities	Prices	Quantities	Prices
Output	6.0	1.9	3.6	9.5	1.8	4.5
Productivity	1.1	1.1	0.8	0.8	0.3	0.3
All Inputs	4.9	2.9	2.8	10.3	1.6	4.8
Input Categories	Growth in quantities relative to all inputs	Growth in prices relative to all inputs	Growth in quantities relative to all inputs	Growth in prices relative to all inputs	Growth in quantities relative to all inputs	Growth in prices relative to all inputs
Capital	-0.1	0.4	-0.6	-0.2	2.7	-1.0
Labour	-2.6	2.7	-1.9	0.0	-1.7	2.0
Energy	0.2	-2.2	1.1	2.6	-1.4	1.3
Materials	1.2	-1.0	0.6	0.5	0.2	-1.1
Services	0.6	-0.3	1.3	-2.4	0.1	1.2

3.2 - Productivity Growth

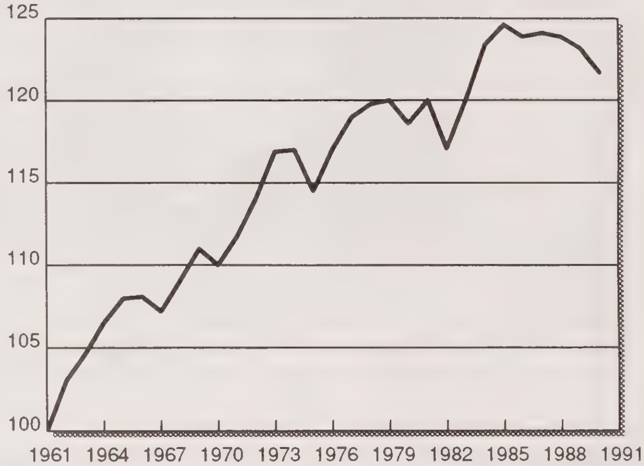
One important determinant of output growth is productivity growth[4]. It followed a pattern similar to that of output, peaking in the 1960s at a rate of 1.1%, falling to 0.8% in the 1970s, reaching a low of 0.3% in the 1980s, and averaging 0.7% for the whole period under study.

This tendency for productivity growth to mimic output growth was also found at a more disaggregated industry level. The four industries with the highest growth rates of output had among the five highest productivity growth rates. Similarly, of the ten highest output growth industries, 70% had above average productivity growth.

Figure 3 demonstrates that productivity growth follows a pro-cyclical path. This is due to the quasi-fixed nature of some inputs. For instance, capital input growth lags output growth, leading to pro-cyclical capacity utilization. Hence, when output declines, capital growth is still just peaking, causing productivity to temporarily fall back. The productivity measure does partially correct for changes in capacity utilization. Productivity growth is calculated by measuring the growth in the quantities of all outputs and inputs, weighting these growth rates by their value shares, and summing them. The value of capital services - income generated by capital services - falls in recessionary periods, thus reducing the estimated contribution of capital. However, this weighting does not remove all the effects of changing capacity utilization.

Figure 3

Multifactor productivity in manufacturing industrie



Some of the cyclicality of productivity is also due to the stickiness of labour input. Labour is somewhat fixed over the short run because of costs associated with temporarily reducing labour input such as training and hiring. Thus, rather than lay off workers during recessionary periods, employers often keep them on.

We can also see that while the general trend for productivity growth was upward, the 1973-1981 period was characterized by particularly poor productivity growth. The causes of this productivity growth decline have been heavily debated, and are probably the result of a combination of factors, a reduction in net capital accumulation and the energy crises being at the forefront of these.

3.3 - Input Growth

Turning to input growth, we can see that average input quantities grew in a fashion similar to output growth; fastest in the 1960s, at 4.9% annually, less in the 1970s at 2.8% and slowest in

4. *Multifactor productivity growth estimates on gross output used in this article are available for total manufacturing and the 21 major groups in the tables of Part 1 of this publication. Quantity and price indices for total manufacturing output and the major KLEMS input categories are provided in the Appendix to this article.*

the 1980s at 1.6%. While the growth of inputs slowed through time; declining productivity growth prevented it from falling as much as output growth.

We will now turn to the make-up of input growth and explain some of the relative changes. The relative growth rates of each input, calculated simply as the growth in its quantity minus the average input growth rate, along with the relative inflation rates, are presented in Table 1 above. These relative growth rates indicate which inputs industries favour by using more of, as well as which are becoming relatively more expensive.

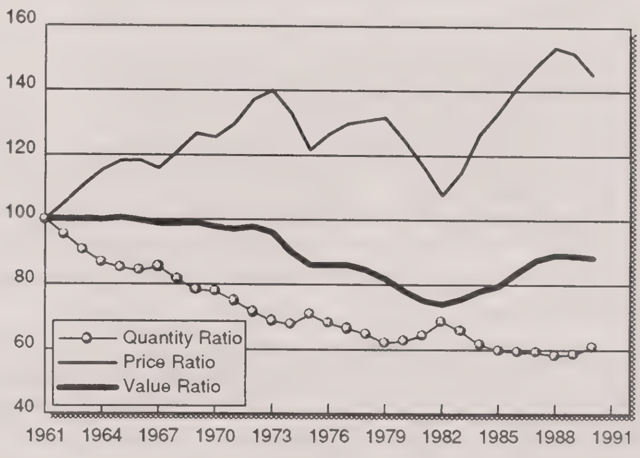
Growth of Primary and Intermediate Inputs

Before examining the individual KLEMS input categories, it is interesting to note the increased reliance on intermediate inputs relative to primary inputs over the past three decades. Establishments increased the quantities of intermediate inputs (energy, materials and services) at more than double the rate of primary inputs (capital and labour), and reduced the value share of primary inputs from 37.1% in the 1960s to 32.5% in the 1980s[5].

The growth in relative intermediate input quantities appear to be primarily driven by productivity growth. The effects of rapid productivity growth in the 1961-1973 period are clear: as the price of primary inputs raced ahead of intermediate inputs, firms continually substituted less costly intermediate inputs for primary inputs. Technical progress was neutral during that period, given that value shares declined only very slightly beginning in the late 1960s. Productivity declines induced increasing relative use of primary inputs, coincident with a fall in their real returns in the 1974/1975 and the 1979/1982 periods, leading to a slackening of intermediate input growth over the 1974 to 1990 time frame. The fall in real returns to primary inputs and slight but continual substitution of intermediate inputs for primary inputs led to upstream vertical de-integration. Hence, technical progress was not neutral during the latter period.

Figure 4

Primary/intermediate inputs, quantity, price and value ratios



The continuing productivity growth and upstream vertical integration support our hypothesis that these phenomena are related. However, it is interesting to note that the most rapid upstream vertical de-integration occurred in a period of extremely weak productivity growth, from 1973 to 1981. Thus, it is obvious that other factors were impacting on the degree of integration. The oil crises likely was one of these factors, as it increased transportation and hence intermediate input costs, resulting in a change in the integration measure.

5. *Intermediate inputs are those goods and services which are produced and consumed in a given year by the business sector of the economy. In an open economy such as Canada, imports may be viewed as primary inputs. However, in the context of the KLEMS database, this would be inappropriate and hence imports have been allocated to their appropriate intermediate input classification.*

We will now turn to an analysis of how output growth affected the use of all inputs, as well as how productivity growth, changing levels of integration and changing relative prices affected the demand for specific types of inputs.

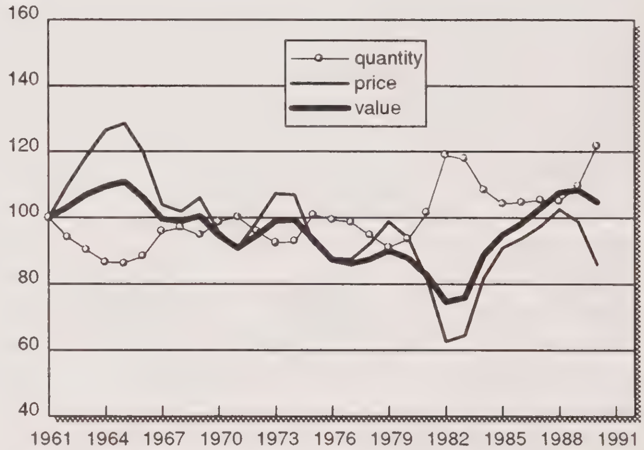
Growth of Capital Inputs

The average annual growth rate of capital matched that of output growth, at 3.7% over the entire 1961-1990 time frame, almost one quarter more than the average of all inputs. Capital input growth peaked in the 1960s, at 4.8%, declined in the 1970s to 2.2% and made a strong recovery in the 1980s, clipping along at a healthy pace of 4.3% annually. It was the only input whose pattern of growth diverged from output growth and was greater in the 1980s than in the 1970s.

As Figure 5 illustrates, capital input growth relative to average input growth appeared to be quite sensitive to its relative price. Table 1 and the accompanying graph relating capital input growth to the growth of all inputs illustrate that capital growth was strongest in relative terms in the 1980s, when its relative inflation rate was most favorable.

Figure 5

Capital/all inputs, quantity, price and value ratios



Falling relative returns, unaccompanied by sufficiently rapid capital formation, depressed capital's share of revenues during the 1965 to 1982 period. Rising capital prices in the mid 1980s and rapid real investment in the latter part of the decade reversed this trend and pushed capital shares up to levels not seen since the 1960s.

The fluctuating relative capital input quantity, price and value ratios were due to a combination of productivity growth and substitution between capital and other inputs. As discussed previously, strong productivity gains in the 1961 to 1973 period permitted primary, and subsequently capital inputs, to realize higher relative returns and encouraged intermediate input substitution for them. Declining productivity growth thereafter reduced the relative return to capital and negated the many of the benefits of substitution.

The long term effect of productivity growth is quite different than the short term effect previously discussed. Capital goods are in fact produced outputs of establishments. Hence, they are subject to the same productivity gains and reduced prices over the long run as intermediate inputs over the short run. The difference in effect arises because capital goods are used up over a much longer time frame and hence it takes longer for productivity growth to affect the quantity and price of capital goods. Consequently, capital growth while varying with respect to output growth over the short run, approximated output growth over the entire 30 year period.

Substitutions between capital and materials and capital and services were also observed during the short run, although each of the inputs quantities and prices grew at about the same rate over the long run. In contrast, capital goods persistently replaced labour, as establishments

continually automated their production processes. These substitution effects will be discussed in greater detail in the sections of the respective substitutes.

Growth in Labour Input

Labour input experienced the lowest average annual growth rate out of the five types of inputs, only 1.0%, over the entire period under study. Growth in labour input was strongest in the 1960s, at 2.3%, marginal in the 1970s at 0.9% and negative in the 1980s at -0.1%.

Figure 6 demonstrates that a strong negative correlation existed between the growth in the quantity and the price of labour, relative to those of average inputs. This was more of a long-run phenomena than was the case with other inputs, as the growth of labour input consistently fell short of that of all inputs while wage increases surpassed average increases in a cyclical manner. The difference in relative growth rates was most marked in the 1960s, where the growth of labour fell short of average input growth by 2.6%, and wages grew by 2.7% more. Due to these extremely low relative growth rates, that were not compensated for by wage increases, labour shares dropped over the 1961 to 1990 period, falling from 24.4% in the 1960s to 23.6% in the 1970s to 21.1% in the 1980s.

Figure 6

Labour/all inputs, quantity, price and value ratios

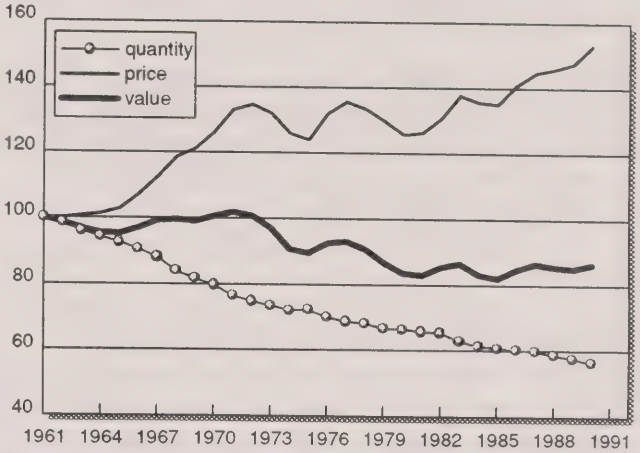
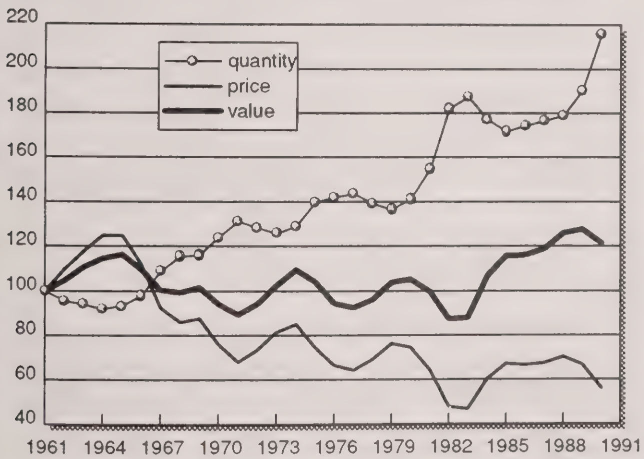


Figure 7

Capital/labour quantity, price and value ratios



Declining labour input growth, while in part a result of falling output growth, was due largely to increasing substitution of capital, materials and services for labour. Had it not been for these substitutions of other inputs for labour input, falling productivity growth would have necessitated relatively higher labour growth.

Figure 7 illustrates that the capital/labour ratio increased considerably from 1961 to 1970 (23.9%), was much flatter in the 1970s, increasing only 13.8%, and exploded by 53.2% in the 1980 to 1990 period. Conversely, increases in the price of labour exceeded those of capital by 78.0% during this entire time frame, almost offsetting the increase in the quantity ratio and maintaining an almost constant share of payments to labour out of primary inputs. The burgeoning capital/labour ratio was likely to have been an effect of both labour saving technological progress, and relative increases in the price of labour. These effects reinforce each other: as the capital/labour ratio increases, the productivity of labour, and thus the wage rate increases and, as the price of labour relative to capital rises, further increases in the substitution of capital for labour are brought about.

Growth in Material Inputs

Material inputs in the manufacturing sector grew at a strong pace of 3.7% throughout the 1961 to 1990 period. As Figure 2 illustrates, this growth was highest in the 1960s and declined sharply through time. In addition, material inputs achieved their highest growth relative to average inputs in the 1960s, concurrent with their lowest relative inflation rate, as Figure 8 shows. Materials also achieved higher relative growth rates and lower relative inflation rates than the average in the latter two decades.

Given the rapid relative quantitative growth of material inputs, material shares generally increased over the 1961 to 1990 period. The average material input share climbed from 48.4% in the 1960s to 50.6% in the 1970s and finally to 52.2% in the 1980s.

The declining growth in material input, while partially due to depressed output growth, was also due to declining productivity growth and subsequently diminishing returns to substitution. Negative productivity growth from 1973 to 1975 and again from 1979 to 1982 caused material prices to surge ahead of average input prices and suffer falling relative growth rates.

Figure 8

Materials/all inputs, quantity, price and value ratios

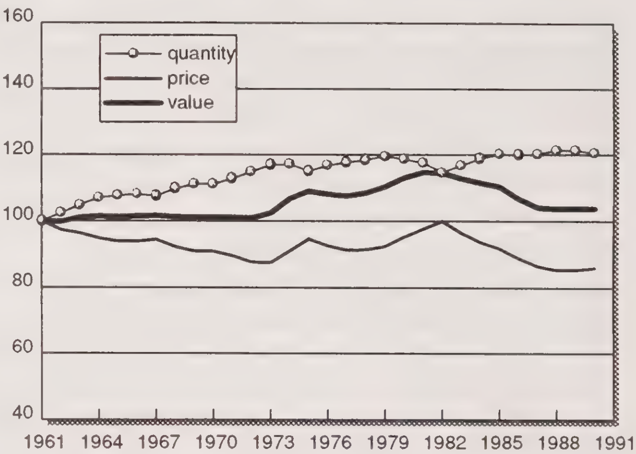
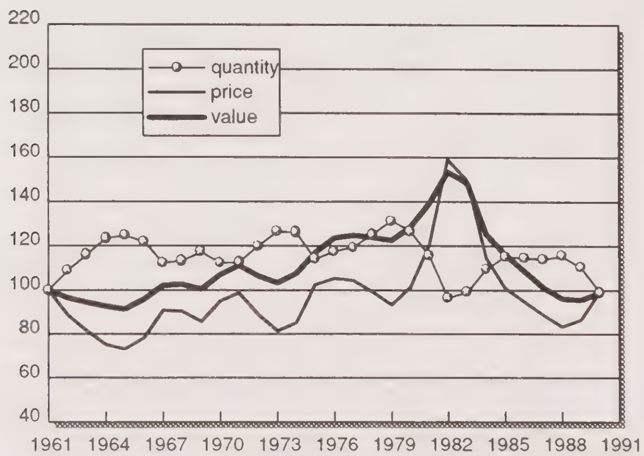


Figure 9

Materials/capital quantity, price and value ratios



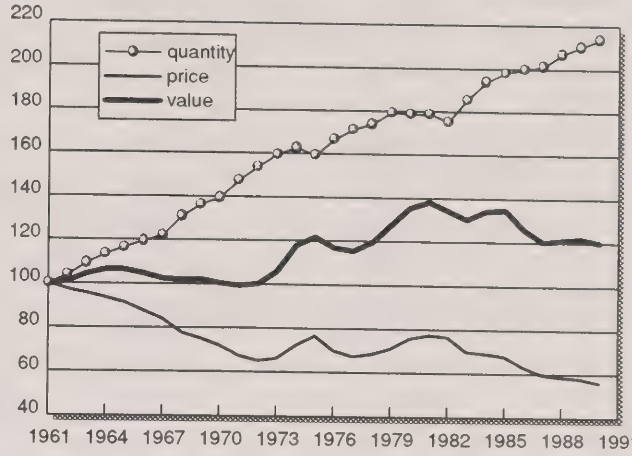
Substitution effects between material and labour inputs, and material and capital inputs also appeared clear throughout the entire period. Figure 9 illustrates that the relative growth of material and capital inputs varied inversely with their relative prices up until 1973, maintaining a relatively constant value ratio between them. The exception to this was the late 1970s and early 1980s, in which rising material prices were not fully offset by declines in their use.

Substitution effects between materials and labour input were more visible than those for capital and materials as changes in relative growth rates and prices were more pronounced. They were also uni-directional, that is, materials were increasingly substituted for labour, rather than trading off as was the case with materials and capital. The increasing use of materials dominated relative wage gains and hence, the value of materials relative to labour rose.

It should be noted that this rise in the value of materials relative to labour inputs, given an overall constant ratio of material and service values to capital values, was a manifestation of decreasing upstream vertical integration. Given that other value shares remained constant and that the share of primary inputs as a whole fell, the decline was accounted for solely by a decline in labour's share.

Figure 10

Materials/labour, quantity, price and value ratios

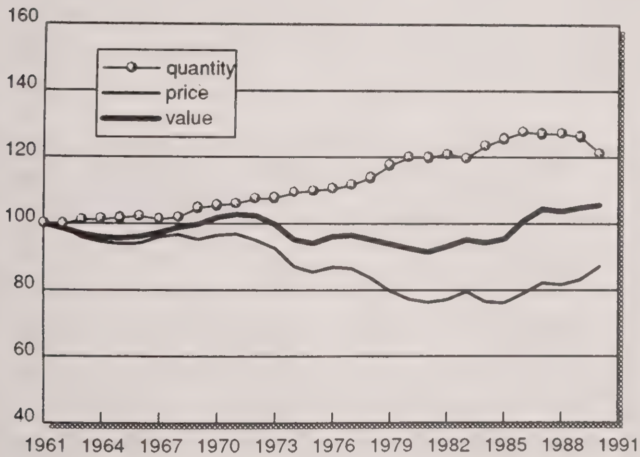


Growth in Service Inputs

The average growth in real service inputs across all manufacturing industries was 3.7%, the same rate as that of output and capital and material inputs. As was the case with most other inputs, the growth in demand for service inputs declined from each decade to the next. Figure 11 illustrates that, in contrast to its absolute growth rate, services grew strongest relative to average inputs in the 1970s, the decade in which its relative inflation rate was lowest. The service input share for all manufacturing industries was remarkably stable throughout the period under study, at 12.8% in the first two decades and rising slightly to 12.9% in the 1980s.

Figure 11

Services/all inputs, quantity, price and value ratios



As was the case with material and capital inputs, ongoing substitution between capital and services occurred during the 1961 to 1990 period. With the exception of the drastic fall in the relative return to capital in the early 1980s, the relative quantity and price changes were basically offsetting, thus rendering constant value shares. These substitution effects were short run phenomena only, as the quantity, price and value ratios in 1990 were exactly those observed in 1961.

While material inputs supplanted labour in somewhat of a cyclical fashion, service inputs did so continually. As in the case of material substitution for labour, this was also a manifestation of decreasing upstream vertical integration.

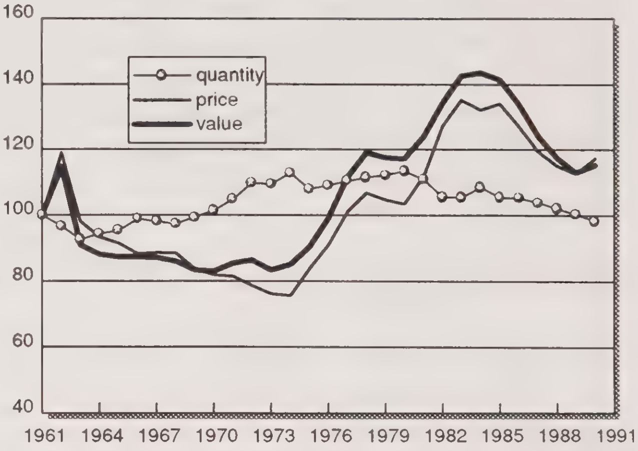
Growth in Energy Inputs

Energy inputs were similar to other inputs in the sense that they achieved their maximum average decade growth rate in the 1960s (5.5%) and their minimum average decade growth rate in the 1980s (0.2%). Energy prices were much more volatile than other inputs, creeping up by less than

three quarters of a percent annually in the 1960s, and exploding to 12.9% annually in the 1970s - more than doubling between 1973 and 1977 alone. The early part of the 1980s were also marked by massive increases in the price of energy, but deflation in the latter part of the 1980s depressed the average during the 1980 to 1990 period to 6.1%.

Figure 12

Energy/all inputs, quantity, price and value ratios



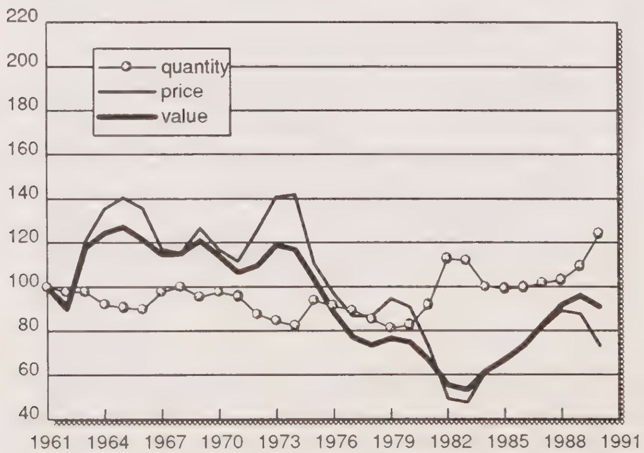
The growth in quantities of energy relative to all inputs appeared to be considerably less responsive to relative changes in its price than other inputs. In fact, similar movements in these rates were frequently observed (1962/63, 1967/68, 1972/73, 1976/78 and 1985/90) throughout the period. Furthermore, the highest growth of energy inputs relative to other inputs occurred in conjunction with its highest relative inflation rate, in the 1970s.

The 1973 oil crisis did lead to a drop in the relative quantities of energy used. However, the decline was only temporary. This weak response of energy use to the energy crisis was likely to have been a result of the fact that while international prices rose, Canadian oil prices were held down by the National Energy Program. Furthermore, energy input shares of total costs, at less than two percent, may also have been too insignificant to incite strong substitution effects in response to relative price changes. Consequently, the relative quantity of energy use increased in 1975 and continued to grow until 1980.

The effects of the oil price shock of 1979 were also muted in Canada by the National Energy Program until 1981. This latter energy shock sustained lasting effects in manufacturing, leading to continuing absolute declines in the quantities until 1984, and an almost uninterrupted decline in the growth of energy inputs relative to total inputs up to 1990.

Figure 13

Capital/energy, quantity, price and value ratios



Due to the drastic rise in the relative price of energy, energy shares experienced the greatest increase of all inputs, rising from 1.6% in the 1960s to 1.7% in the 1970s and finally to 2.3% in the 1980s.

Energy inputs, in contrast to other inputs, have generally been thought to be complements in production to capital. This does appear to be the case, particularly in the 1961-1973 period, in which the relative use of capital/energy was only weakly responsive to the relative price ratios. However, taking a longer term perspective, we can see that the price of capital relative to energy fluctuated randomly between 1961 and 1973 and declined thereafter. On the other hand, the quantity ratio fluctuated until

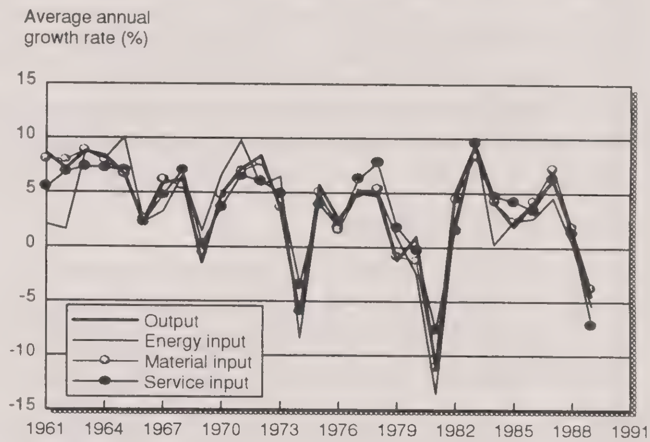
1979 and increased in subsequent years. Therefore, there does appear to be a long term substitution effect. In addition to this substitution, the unusually rapid capital accumulation that began after the second oil crisis may have been an attempt to adopt energy saving capital.

4 - Fixed Versus Variable Inputs

In addition to looking at average growth rates through time, it is also useful to examine the relative fixity or variability of inputs. Figures 14 and 15 illustrate that all inputs, except for capital, generally followed a common pattern: they all declined in recessionary periods and increased in times of strong economic growth. Capital input growth lagged output growth and rarely fell as much as other inputs in times of weakening output growth.

Figure 14

Growth in output, energy, material and services



The variance of the ratio between output and input growth for each input category illustrates the degree to which firms harmonized their input growth with their output growth. The higher the variance, the more sticky the input.

The variance of the output/input growth rate was highest for capital inputs, at 44.3/100, and lowest for materials and services at 0.5/100 and 3.5/100 respectively. This illustrates the strong relative fixity of capital inputs. Material inputs were almost perfectly harmonized with output growth. This is to be expected as input measures correspond to inputs used, rather than purchased. Any input not used in the reference year accumulates in the inventories, and inventory stocks are not included in the input estimates used for productivity measures. Material inputs can be stored; hence their use, after purchase, can be adjusted relative to demand for the establishment's output[6].

While the variance of the output/energy input ratio, at 6.1/100, was higher than that for labour at 5.7/100, throughout the 1961 to 1990 period, labour input growth was more volatile in the 1970s and the 1980s. Thus, the moderately high variance of the labour partial productivity growth rate does suggest some fixity of labour input as well. This could be due to labour hoarding or a high degree of administrative labour. Clearly, however, labour input growth was much more synchronized with output growth than capital inputs.

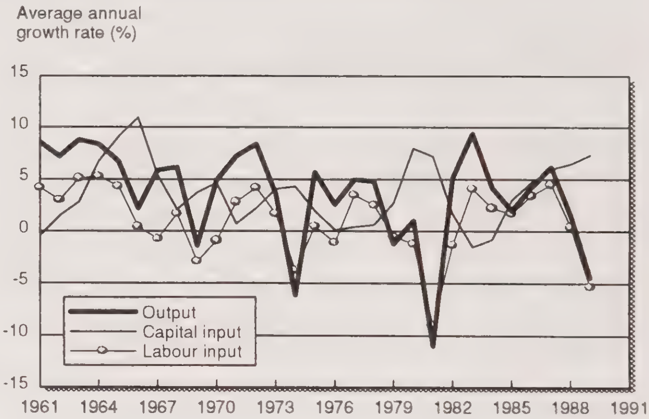
Firms appeared to adjust their use of materials and services more rapidly than they adjusted their use of labour or capital. This flexibility of intermediate input use suggests that capital intensive or value-added industries are likely to have higher variability in their multifactor productivity (MFP)

6. *Note that in comparing the variance of partial productivity growth rates for each input category, it is implicitly assumed that technology affects all inputs in the same degree. It could be argued that the entire thirty year period is a sufficiently long time to afford the opportunity for technology to affect the levels of the partial productivity growth rates disproportionately. For example, if technological progress is primarily labour saving, then the partial productivity growth rate would increase through time, and other things equal, would lead to a higher variance in the partial productivity growth rate. However, even on a decade basis, the above assertions, regarding the relative fixity of inputs, hold.*

growth rates, than industries that use more intermediate inputs. This hypothesis is supported by the high variance of MFP growth rates of industries which are highly capital or capital and labour intensive. Of the industries with the ten highest variances in MFP growth (weighted by the average MFP growth rate for that industry), seven also placed in the top ten of industries ranked according to capital input share and six placed in the top ten industries ranked according to primary input shares.

Figure 15

Growth in output, capital and labour



This quasi-fixed nature of capital and labour input may also be an additional factor in explaining the increasing specialization of industries through time: a higher intermediate input shares allows firms to adjust their inputs more quickly in response to market conditions.

5 - Industry Breakdown

Turning to a summary of the industry breakdown, there were five strong growth industries throughout the 1961 to 1990 period: plastic products, transportation equipment, electrical and electronic products, machinery and chemical and chemical products industries. Transportation equipment and electrical and electronic products industries generally broke with the trend in manufacturing and increased their inputs most in the first and last decade, rather than having growth rates that steadily declined through time.

There were two declining industries - tobacco products and leather and allied products industries, and a third consistently low growth industry, primary textile and textile products industries. Input growth was also low in the refined petroleum and coal products industries in the 1960s and the 1980s, but was second highest of all industries in the 1970s.

There appeared to be a set pattern of growth among industries. They typically behaved in a consistent fashion across their use of inputs; that is, if a particular industry's annual average growth rate for one category of inputs was above the manufacturing average, then the average growth rate for the rest of its inputs was also likely to have been above the average. While the rankings of these growth rates were very similar, the values varied significantly across industries.

Price indices are available for each industry - given that industries use different types and combinations of inputs within each category of inputs, and thus, face different aggregate prices. However, the growth of most prices, excluding those of capital, varied little among individual industries. Furthermore, the direction of the changes in the average growth rates from one decade to the next were almost unanimous among industries for labour, energy, materials and services. Indeed, there was not a single industry in which the growth in the price of any of these inputs was higher in the 1960s than in the 1970s. With respect to the 1970s and the 1980s, the services category was the only input which had higher growth rates of prices in the 1980s than in the1970s, although this only occurred in four of the 21 industries.

The growth of the price of capital did display some variation across industries, ranging from a high of 8.9% in the plastic products industries to a low of zero percent in the refined petroleum and coal products industries. Similarly, there was some variation in the direction of the changes in these growth rates; there were five industries that had higher growth rates of capital input prices in the 1960s than in the 1970s, and there were five industries again in the 1980s that had higher growth rates of capital input prices in the 1980s than in the 1970s.

6 - Summary

This article reviews the structure, growth and adaptation in Canadian manufacturing from 1961 to 1990, using the KLEMS database. Output and productivity growth in the manufacturing sector were most rapid in the 1960s, concurrent with the lowest inflation rate observed among the three decades. The 1970s, with ballooning energy prices and other business costs commenced the decline of output growth and productivity growth that only worsened in the 1980s.

Manufacturing industries became increasingly upstream vertically de-integrated throughout the 1961 to 1990 period. This may have been, in part, a result of the benefits of specialization and economies of scale, coupled with increasingly complex production processes and globalized trade.

Manufacturing industries were sensitive to relative price changes, substituting capital, material and service inputs for each other over the short run and for labour inputs over the short and long run. Energy input growth was only mildly dented by the 1973 oil crisis, likely because energy input shares accounted for less than two percent of total costs. However, the second oil shock seems to have brought about relative declines in the use of energy. The fear of impending massive increases in energy costs instigated by these crises may have been partially responsible for rapid capital formation in the 1980s, as firms may have sought to adopt energy saving capital.

The strong productivity growth of the 1961 to 1973 period raised efficiency and hence the relative return to primary inputs, thereby stimulating substitution of intermediate inputs for them. Declining productivity growth in subsequent years continually mitigated differences in relative returns, and consequently reduced the growth differentials. Productivity growth over the entire period, however, resulted in falling capital prices and capital formation matching output growth. Thus, the long run effect of productivity growth was to raise real wages and encourage substitution of other inputs for labour.

Capital, and to a lesser extent labour inputs, were relatively fixed factors in production. Energy input growth was more volatile relative to output growth in the 1960s but was closely synchronized with output growth in the 1970s and the 1980s. Material inputs were almost perfectly harmonized with output growth. This relative fixity of primary inputs, in particular capital, may be an additional contributing factor to the de-integration of industries, as they attempted to achieve an input mix that could be more responsive to fluctuations in the demand for their output.

This article has illustrated changes in Canadian manufacturing industries, and provided some insight on why these developments occurred. Further work in this area, with the use of econometric techniques, would enable more concrete conclusions about price elasticities, sensitivities of factor input to technological progress as well as factor contribution to productivity growth, and the relation between productivity growth and upstream vertical integration.

Table 2

The KLEMS data for Canadian manufacturing industry 1961-1990, index levels, 1961=100

Year	Output		Capital		Labour		Energy		Materials		Services	
	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price	Quantity	Price
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	109.0	101.2	99.6	117.7	104.3	103.0	102.1	100.6	108.4	102.4	105.6	101.6
1963	117.1	102.3	101.1	127.6	107.5	106.9	103.7	102.5	117.4	103.6	113.2	102.2
1964	127.9	103.6	104.0	141.4	113.1	111.2	113.3	102.2	128.4	104.7	121.8	103.7
1965	139.2	105.0	111.2	145.6	119.3	117.0	122.9	103.7	139.0	106.4	131.1	106.7
1966	148.7	107.5	121.8	133.6	124.5	126.2	136.0	102.7	148.7	109.6	140.6	109.7
1967	152.1	109.9	136.0	120.1	125.0	133.7	139.2	104.2	152.7	111.1	143.8	114.3
1968	161.3	112.1	143.5	125.8	124.2	144.2	143.9	106.9	162.5	112.7	150.8	118.8
1969	171.6	115.7	146.5	137.2	126.3	155.5	153.6	105.3	171.9	116.4	161.9	123.1
1970	169.2	118.9	152.0	116.5	122.7	167.6	155.9	108.8	171.1	119.4	162.4	128.1
1971	177.7	122.1	159.3	127.4	121.6	180.8	166.6	112.3	179.4	121.9	168.6	131.7
1972	190.9	127.5	160.4	145.3	125.1	194.8	183.8	114.6	192.4	127.7	180.1	138.4
1973	207.6	140.3	164.1	181.0	130.4	210.6	194.5	121.0	207.9	145.4	191.4	148.6
1974	215.2	169.4	170.9	207.7	132.6	241.7	207.5	155.4	215.8	184.5	201.2	168.9
1975	202.4	191.9	178.5	195.0	127.7	277.1	190.7	187.3	203.5	208.1	194.4	189.4
1976	214.4	202.0	182.1	203.2	128.4	316.5	199.7	228.8	214.1	217.4	202.4	208.2
1977	220.0	216.9	182.3	227.5	127.0	347.8	204.2	274.2	217.6	236.0	206.4	221.6
1978	231.3	237.9	183.0	264.5	131.5	373.9	215.3	308.0	228.9	262.6	219.8	237.4
1979	242.6	272.0	184.1	329.3	134.8	413.0	226.8	335.0	241.7	304.5	237.8	258.2
1980	239.8	308.4	189.2	330.1	134.2	456.0	229.2	384.6	239.8	352.5	242.4	281.9
1981	242.2	345.9	204.9	330.6	132.5	525.4	223.7	480.8	237.0	407.1	241.8	313.8
1982	216.9	368.7	220.3	247.1	121.1	580.1	195.4	574.2	212.4	429.5	224.1	342.7
1983	228.3	379.8	224.1	322.3	119.6	618.5	200.4	625.6	222.2	435.8	227.7	360.3
1984	250.7	395.9	220.6	421.3	124.6	647.1	220.5	640.9	241.7	457.4	250.8	372.2
1985	261.6	402.5	218.9	461.0	127.4	683.1	221.2	668.3	252.3	456.8	263.3	386.5
1986	266.9	399.5	225.6	475.9	129.6	714.1	226.7	600.4	258.6	430.0	275.0	407.1
1987	278.4	412.5	236.6	509.7	134.0	738.3	232.9	596.3	269.9	442.5	284.9	419.8
1988	296.0	429.0	251.1	558.1	140.3	770.7	243.9	596.4	290.3	453.2	303.8	432.5
1989	300.6	440.8	268.0	528.5	140.8	800.4	245.1	603.7	296.1	464.8	308.2	457.1
1990	287.7	446.4	288.3	457.5	133.5	844.6	232.4	658.2	285.4	465.9	286.9	470.5

PART 1

Multifactor Productivity

Experimental Data

Table 1

Indices of multifactor productivity, business sector industries (1986=100)

Year	Industry measures: Value-added: Persons at work	Industry measures: Value-added: Person-hours	Interindustry measures: Persons at work	Interindustry measures: Person-hours
1972	94.0	91.1	94.9	92.6
1973	97.2	94.1	97.6	95.1
1974	94.5	91.9	95.4	93.2
1975	92.5	90.4	93.7	92.0
1976	95.8	93.9	96.4	94.9
1977	95.9	94.8	96.5	95.7
1978	96.1	94.6	96.7	95.5
1979	96.3	95.2	96.9	96.0
1980	95.2	94.3	96.0	95.2
1981	95.3	94.9	96.0	95.7
1982	90.3	91.0	92.0	92.5
1983	93.7	94.5	94.8	95.5
1984	98.0	98.3	98.4	98.6
1985	99.0	99.1	99.2	99.3
1986	100.0	100.0	100.0	100.0
1987	101.3	100.8	101.1	100.6
1988	101.5	100.7	101.2	100.6
1989	100.6	100.3	100.5	100.2
1990	97.2	97.1	97.7	97.6
1991	96.1	96.4	96.8	96.5
1992	96.1	96.8	96.8	96.9

Average annual growth rate (%) 1972-1992

Table 2

Indices of multifactor productivity, agricultural & related services industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	87.3	85.6	85.1	83.3	82.4	80.1
1973	91.1	88.7	89.0	86.4	86.1	83.1
1974	81.6	79.4	79.4	77.0	77.5	74.8
1975	87.5	85.1	85.3	82.8	83.0	80.2
1976	92.5	90.2	90.4	87.9	88.3	85.6
1977	90.3	88.8	88.1	86.5	85.9	84.1
1978	88.2	87.1	86.0	84.8	83.5	82.1
1979	84.2	83.0	82.0	80.6	79.7	78.2
1980	86.3	85.7	84.1	83.4	81.4	80.6
1981	90.9	90.3	88.8	88.1	85.8	85.2
1982	93.6	93.0	92.1	91.4	87.6	87.0
1983	92.7	92.8	91.0	91.2	88.4	88.6
1984	93.1	93.2	91.5	91.7	90.3	90.5
1985	92.1	91.8	90.3	89.9	89.8	89.5
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	98.5	98.5	98.1	98.2	98.9	98.9
1988	98.5	99.2	98.2	99.0	99.5	100.1
1989	104.3	104.7	105.3	105.7	106.4	106.7
1990	111.3	111.2	113.6	113.6	113.9	113.8

Average annual growth rate (%) 1972-1990

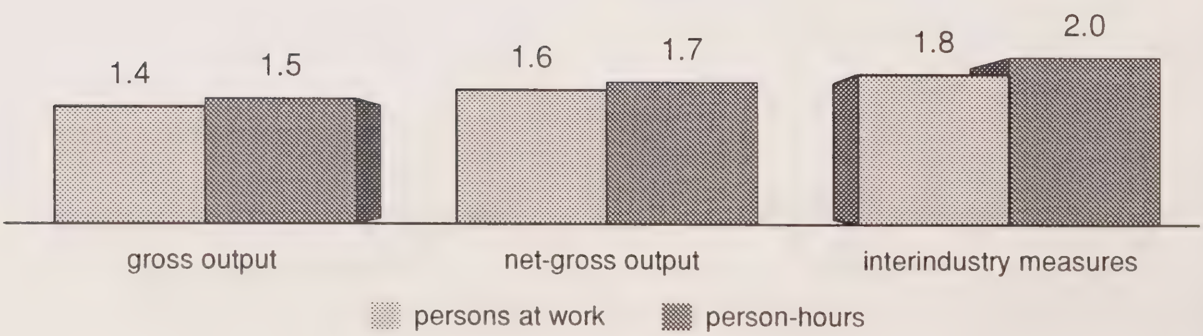


Table 3

Indices of multifactor productivity, manufacturing industries (1986=100)

Year	Industry measures						Interindustry measures	
	Gross output		Net-gross output		Value-added			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	92.7	92.1	90.6	89.8	79.9	78.3	90.5	89.1
1973	94.9	94.3	93.4	92.7	85.0	83.6	94.8	93.4
1974	94.8	94.4	93.3	92.8	84.9	83.8	93.2	92.0
1975	92.5	92.4	90.3	90.2	78.9	78.7	89.6	89.0
1976	94.5	94.5	92.9	92.8	84.2	83.9	93.1	92.5
1977	96.2	96.0	95.1	94.9	88.7	88.2	94.7	94.2
1978	96.9	96.7	96.0	95.7	90.7	90.0	95.4	94.7
1979	96.9	96.9	96.0	96.0	90.6	90.5	95.6	95.3
1980	95.7	95.7	94.5	94.5	87.3	87.3	93.3	93.2
1981	96.6	96.9	95.6	96.0	89.9	90.7	93.6	93.8
1982	94.0	94.5	92.3	92.9	82.3	83.6	89.4	90.1
1983	96.7	96.9	95.7	96.0	89.9	90.5	93.3	93.8
1984	99.6	99.6	99.5	99.4	98.7	98.6	98.5	98.6
1985	100.6	100.6	100.8	100.7	101.8	101.8	100.1	100.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.3	100.2	100.4	100.3	101.0	100.6	101.0	100.7
1988	100.2	100.0	100.3	100.0	100.7	100.1	101.5	101.1
1989	99.5	99.4	99.3	99.2	98.5	98.3	100.6	100.5
1990	98.2	98.2	97.7	97.7	94.9	94.9	98.6	98.6
1991	..	..	..	..	92.1	92.2	..	..
1992	..	..	..	..	93.4	94.1	..	..

Average annual growth rate (%) 1972-1990

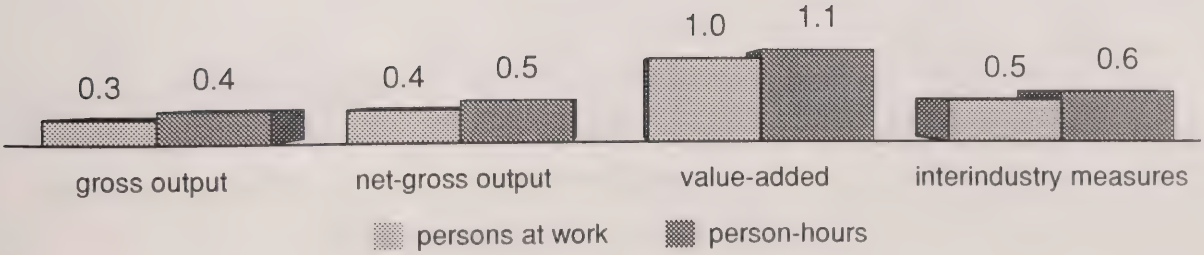


Table 4

Indices of multifactor productivity, construction industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	92.8	91.4	92.8	91.3	90.7	88.3
1973	91.9	90.4	91.9	90.4	91.0	88.4
1974	90.9	89.4	90.9	89.4	88.9	86.7
1975	94.8	93.4	94.8	93.4	90.8	88.9
1976	97.5	96.4	97.5	96.4	94.4	92.8
1977	98.3	98.2	98.3	98.2	95.3	94.8
1978	96.9	96.3	96.9	96.3	94.5	93.4
1979	95.5	94.8	95.5	94.8	93.6	92.6
1980	97.8	96.9	97.8	96.9	95.4	94.2
1981	101.4	100.8	101.4	100.8	98.6	97.9
1982	103.3	104.6	103.3	104.6	96.9	98.3
1983	103.4	104.2	103.4	104.2	99.2	100.2
1984	101.2	101.5	101.2	101.5	99.9	100.2
1985	99.2	98.9	99.2	98.9	99.3	99.0
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.3	99.1	100.3	99.1	101.1	99.8
1988	99.2	97.7	99.2	97.7	100.5	98.6
1989	99.2	97.9	99.2	97.9	99.7	98.3
1990	97.9	97.7	97.9	97.6	97.1	96.6

Average annual growth rate (%) 1972-1990

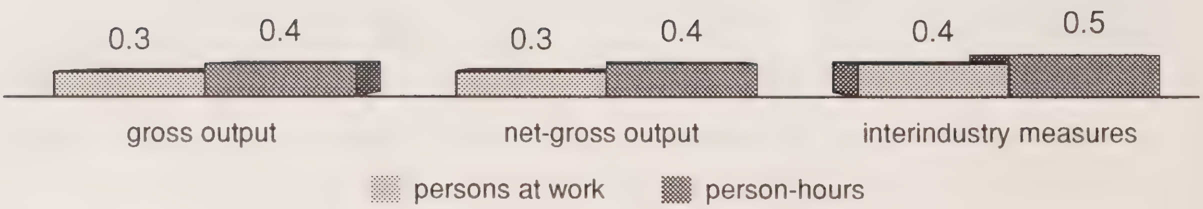


Table 5

Indices of multifactor productivity, transportation & storage industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	90.1	89.0	89.0	87.7	92.2	90.3
1973	91.5	90.3	90.5	89.1	94.7	92.6
1974	90.5	89.4	89.4	88.2	92.9	91.1
1975	89.6	89.0	88.4	87.8	90.9	89.8
1976	89.7	89.2	88.4	87.9	91.1	90.1
1977	90.2	90.1	89.1	88.9	91.7	91.3
1978	92.4	91.9	91.5	90.9	93.7	92.8
1979	96.8	96.5	96.4	96.1	98.6	98.0
1980	93.3	92.8	92.5	92.0	94.2	93.4
1981	92.5	92.6	91.5	91.7	92.9	93.0
1982	90.8	91.4	89.7	90.3	89.7	90.4
1983	95.2	96.3	94.6	95.9	95.2	96.6
1984	99.1	99.6	98.9	99.5	99.2	99.9
1985	99.4	99.7	99.3	99.7	99.7	100.3
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.1	102.2	103.6	102.5	103.7	102.5
1988	106.3	105.2	107.2	106.0	107.2	105.9
1989	104.8	104.2	105.5	104.8	105.3	104.6
1990	103.9	103.3	104.5	103.7	103.2	102.5

Average annual growth rate (%) 1972-1990

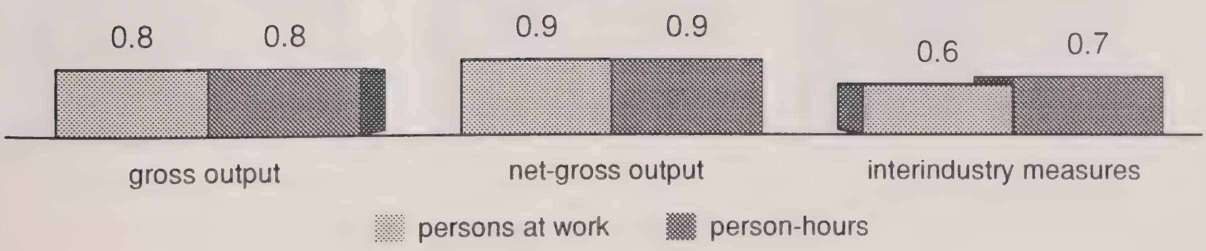


Table 6

Indices of multifactor productivity, telecommunication industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	58.7	58.2	57.7	57.2	58.1	57.4
1973	61.4	60.9	60.5	60.0	61.1	60.3
1974	64.7	64.2	63.9	63.4	64.4	63.6
1975	69.3	69.2	68.5	68.4	68.8	68.5
1976	71.3	71.2	70.5	70.5	71.1	70.8
1977	72.3	72.5	71.6	71.8	72.1	72.2
1978	76.4	76.2	75.8	75.6	76.3	75.9
1979	81.0	81.0	80.5	80.4	81.0	80.8
1980	86.9	86.7	86.6	86.3	87.2	86.8
1981	89.3	89.6	89.0	89.2	89.6	89.8
1982	86.2	86.8	85.8	86.4	85.6	86.2
1983	88.0	89.0	87.7	88.7	87.5	88.6
1984	92.8	93.2	92.6	93.0	92.8	93.2
1985	96.1	96.4	96.0	96.3	96.0	96.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.0	104.3	104.1	104.4	104.1	104.3
1988	106.0	106.1	106.2	106.3	106.0	106.0
1989	110.8	111.1	111.1	111.4	110.4	110.5
1990	111.7	111.9	112.1	112.3	110.2	110.3

Average annual growth rate (%) 1972-1990

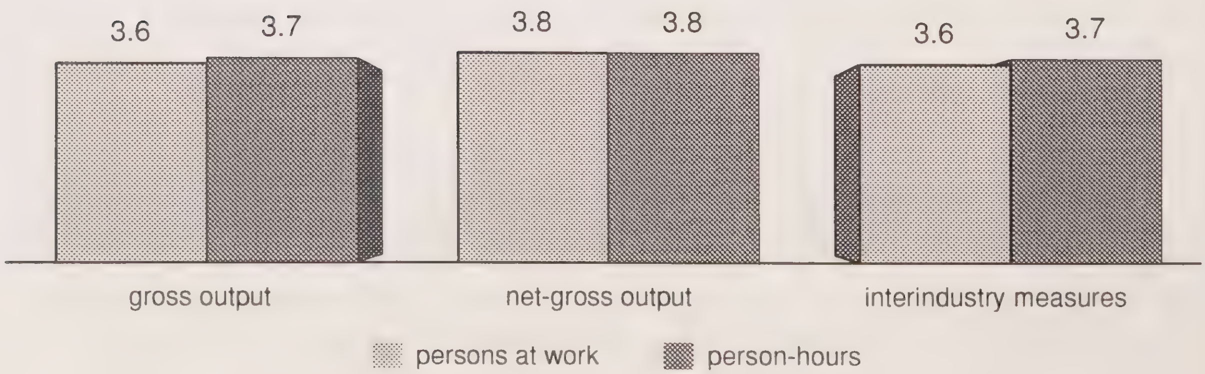


Table 7

Indices of multifactor productivity, wholesale trade industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	89.4	88.1	89.2	87.9	89.0	87.2
1973	90.5	88.2	90.3	88.0	90.7	87.9
1974	89.4	88.3	89.2	88.2	89.3	87.8
1975	89.2	88.7	89.0	88.5	88.5	87.6
1976	91.0	90.5	90.9	90.3	90.6	89.7
1977	86.9	87.1	86.7	86.9	86.4	86.5
1978	85.5	85.0	85.3	84.8	85.2	84.4
1979	88.5	88.6	88.3	88.4	88.5	88.4
1980	92.6	92.5	92.4	92.4	92.3	92.0
1981	92.9	93.1	92.8	92.9	92.4	92.5
1982	89.2	89.8	89.1	89.7	87.5	88.1
1983	91.9	93.0	91.8	92.9	90.6	91.8
1984	93.0	94.0	92.8	93.9	92.6	93.7
1985	96.4	97.3	96.4	97.3	96.2	97.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.6	101.6	101.6	101.6	101.9	101.8
1988	103.8	103.8	103.9	103.9	104.2	104.1
1989	104.5	105.1	104.6	105.2	104.5	105.2
1990	101.0	101.1	101.1	100.9	100.2	100.0

Average annual growth rate (%) 1972-1990

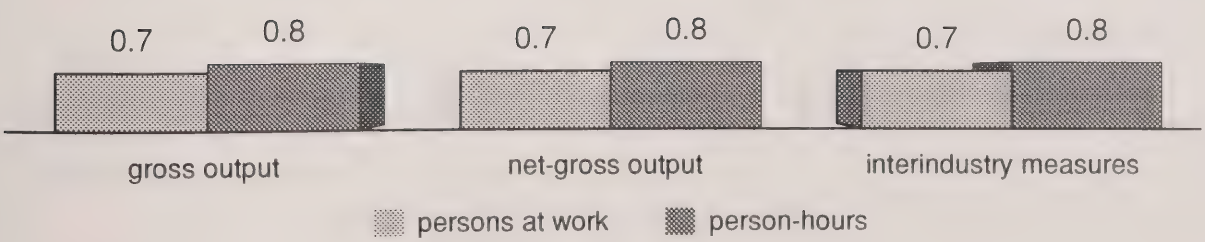


Table 8

Indices of multifactor productivity, retail trade industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	96.3	91.4	96.2	91.4	96.2	90.8
1973	96.4	92.1	96.4	92.0	97.0	92.1
1974	94.7	90.7	94.7	90.7	94.7	90.2
1975	95.8	92.1	95.8	92.1	95.2	91.2
1976	99.0	96.1	99.0	96.1	98.9	95.7
1977	98.8	96.5	98.8	96.5	98.6	96.1
1978	97.6	95.8	97.6	95.7	97.5	95.4
1979	96.5	94.8	96.5	94.8	96.5	94.6
1980	94.3	92.9	94.2	92.9	94.0	92.5
1981	92.7	91.8	92.7	91.8	92.4	91.5
1982	91.8	92.1	91.8	92.1	90.2	90.5
1983	97.9	99.1	97.9	99.1	96.6	97.9
1984	98.8	99.3	98.8	99.3	98.3	98.8
1985	99.6	99.9	99.6	99.9	99.3	99.7
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.1	103.3	103.1	103.4	103.2	103.4
1988	103.1	103.6	103.1	103.6	103.1	103.4
1989	103.3	104.0	103.3	104.1	102.9	103.6
1990	101.0	99.3	101.0	101.3	99.5	99.7

Average annual growth rate (%) 1972-1990

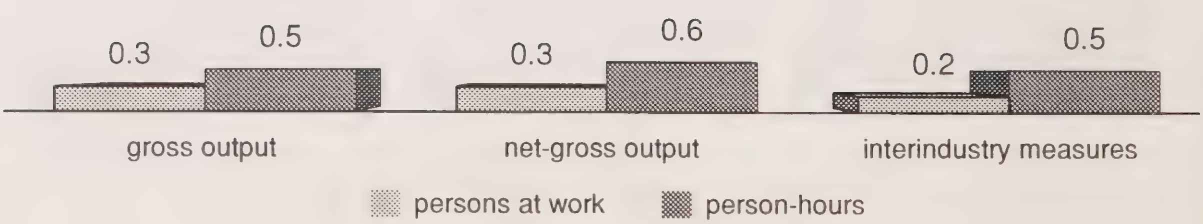


Table 9

Indices of multifactor productivity, food industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	97.3	96.7	96.8	96.2	90.2	88.1
1973	98.2	97.7	97.9	97.3	94.2	91.7
1974	98.0	97.6	97.7	97.1	88.7	86.5
1975	96.5	96.0	95.8	95.3	88.0	85.9
1976	99.1	98.6	99.0	98.4	94.0	91.9
1977	100.0	99.7	100.0	99.6	94.5	92.9
1978	100.0	99.7	100.0	99.6	93.7	92.3
1979	100.0	99.8	100.0	99.7	91.9	90.6
1980	98.8	98.7	98.6	98.5	90.5	89.9
1981	98.4	98.5	98.1	98.2	92.0	91.7
1982	98.7	98.9	98.5	98.6	92.1	92.1
1983	98.4	98.2	98.1	97.9	92.9	92.9
1984	99.3	99.1	99.2	98.9	95.5	95.4
1985	100.5	100.4	100.6	100.5	97.1	97.0
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.8	99.7	99.8	99.6	99.6	99.4
1988	98.0	97.7	97.7	97.4	97.6	97.4
1989	96.5	96.3	95.9	95.8	97.7	97.7
1990	96.2	95.8	95.6	95.2	98.8	98.3

Average annual growth rate (%) 1972-1990

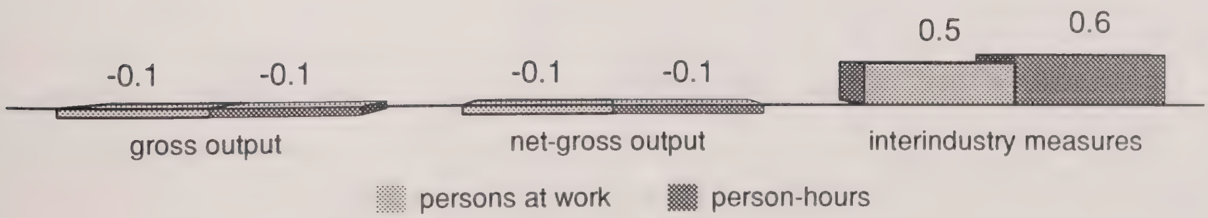


Table 10

Indices of multifactor productivity, beverage industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	106.1	105.0	106.5	105.4	104.2	102.0
1973	110.6	109.6	111.2	110.2	110.6	108.5
1974	108.8	107.8	109.3	108.3	107.4	105.5
1975	106.3	105.3	106.7	105.6	103.2	101.5
1976	106.0	105.0	106.4	105.4	105.2	103.5
1977	108.8	108.0	109.3	108.5	107.9	106.7
1978	108.0	107.3	108.5	107.7	107.9	106.6
1979	108.4	107.8	108.9	108.2	108.2	107.1
1980	107.8	107.5	108.3	108.0	106.8	106.1
1981	107.2	107.2	107.7	107.6	106.5	106.4
1982	104.2	104.3	104.5	104.6	101.1	101.4
1983	103.6	103.5	103.8	103.8	102.1	102.2
1984	103.8	104.4	104.1	104.7	104.3	104.9
1985	102.3	102.2	102.4	102.3	102.9	102.8
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.5	101.3	101.7	101.3	102.0	101.6
1988	103.3	102.6	103.5	102.8	104.0	103.1
1989	105.1	105.3	105.4	105.6	105.6	105.7
1990	106.7	106.7	107.1	107.1	106.3	106.1

Average annual growth rate (%) 1972-1990

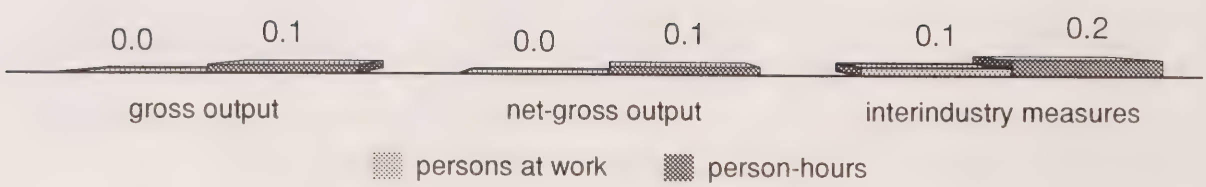


Table 11

Indices of multifactor productivity, tobacco products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	104.8	102.9	105.3	103.1	100.2	96.8
1973	106.2	104.6	107.0	105.1	103.8	100.5
1974	109.0	107.6	110.5	108.8	103.7	100.8
1975	107.6	106.0	108.8	106.9	102.9	100.1
1976	106.5	104.9	107.5	105.6	104.3	101.4
1977	114.0	112.8	116.7	115.2	112.6	110.5
1978	108.7	107.4	110.2	108.7	106.2	104.0
1979	109.6	108.2	111.2	109.7	106.4	104.2
1980	110.3	109.3	112.1	111.0	107.6	105.9
1981	109.8	108.6	111.6	110.2	108.4	106.8
1982	109.5	108.7	111.2	110.3	106.5	105.5
1983	106.5	105.7	107.7	106.7	104.7	104.0
1984	105.2	104.5	106.1	105.3	104.8	104.0
1985	100.5	99.5	100.6	99.4	99.3	98.1
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.7	105.2	106.5	106.0	106.6	105.9
1988	110.1	109.5	111.5	110.8	111.6	110.8
1989	108.3	107.9	109.4	108.9	110.0	109.4
1990	106.1	105.5	106.8	106.1	107.5	106.7

Average annual growth rate (%) 1972-1990

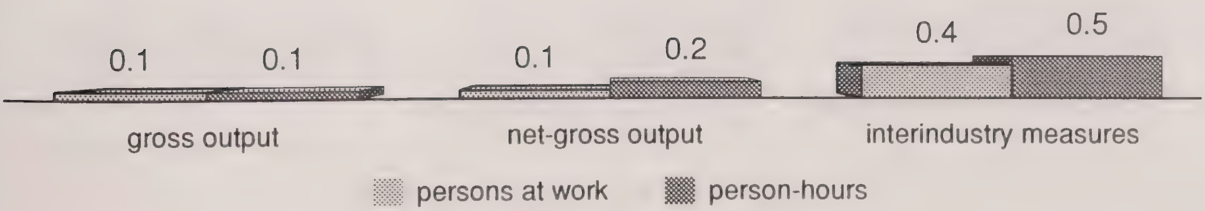


Table 12

Indices of multifactor productivity, plastic products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	96.6	96.0	96.5	95.9	94.4	93.1
1973	98.0	97.6	97.9	97.5	98.1	97.0
1974	92.6	92.6	92.3	92.4	91.7	91.3
1975	88.1	88.3	87.7	87.9	84.3	84.2
1976	88.9	88.9	88.5	88.5	86.1	86.0
1977	90.4	90.5	90.1	90.2	87.1	87.1
1978	93.8	93.8	93.5	93.6	91.4	91.2
1979	97.4	96.9	97.3	96.8	97.3	96.6
1980	95.0	95.1	94.8	94.9	93.0	93.0
1981	98.9	98.8	98.9	98.7	97.2	97.1
1982	97.4	97.5	97.3	97.4	92.0	92.3
1983	101.8	101.5	101.8	101.5	99.2	99.1
1984	104.0	103.9	104.1	104.1	103.8	103.9
1985	104.1	103.8	104.2	103.9	103.8	103.6
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.2	99.0	99.1	99.0	100.4	100.2
1988	96.2	96.0	96.0	95.8	98.6	98.1
1989	95.0	94.5	94.8	94.2	97.4	96.8
1990	92.9	92.7	92.6	92.4	93.9	93.6

Average annual growth rate (%) 1972-1990

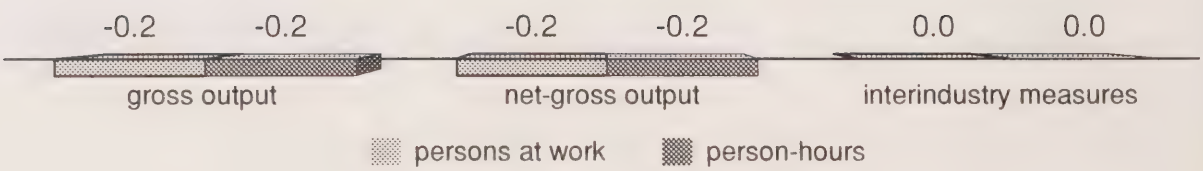


Table 13

Indices of multifactor productivity, rubber products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	86.7	85.7	86.4	85.3	84.7	83.1
1973	89.5	88.6	89.2	88.3	88.7	87.2
1974	85.0	84.7	84.6	84.3	83.7	83.0
1975	82.0	81.9	81.6	81.4	79.0	78.6
1976	88.7	88.3	88.4	88.0	86.1	85.5
1977	95.2	95.0	95.1	94.8	92.6	92.2
1978	97.0	96.6	96.8	96.5	95.1	94.4
1979	100.8	99.7	100.8	99.6	100.3	99.0
1980	97.1	96.9	97.0	96.8	95.1	94.7
1981	95.0	94.5	94.8	94.3	93.5	92.9
1982	91.5	91.2	91.3	90.9	87.1	86.9
1983	96.7	96.3	96.6	96.2	94.0	93.7
1984	105.5	105.1	105.7	105.2	104.7	104.4
1985	106.5	106.0	106.6	106.1	106.2	105.7
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.0	103.8	104.1	103.9	104.8	104.6
1988	104.0	103.3	104.0	103.4	105.4	104.5
1989	103.0	102.5	103.0	102.5	104.2	103.6
1990	102.5	102.4	102.5	102.5	102.5	102.3

Average annual growth rate (%) 1972-1990

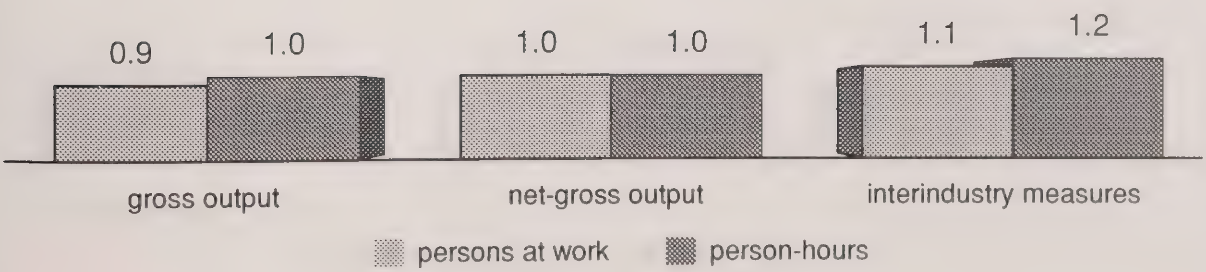


Table 14

Indices of multifactor productivity, leather & allied products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	86.6	85.0	85.4	83.7	82.2	80.0
1973	87.2	86.0	86.1	84.8	83.7	81.8
1974	88.6	86.9	87.6	85.8	84.5	82.2
1975	87.5	86.7	86.5	85.6	82.2	81.1
1976	92.2	91.1	91.5	90.3	88.9	87.4
1977	93.2	92.0	92.7	91.3	90.3	88.8
1978	98.5	97.5	98.5	97.4	96.3	94.9
1979	97.6	96.4	97.5	96.1	96.6	95.0
1980	96.1	95.3	95.8	94.9	93.7	92.6
1981	97.2	96.4	97.0	96.1	95.2	94.2
1982	95.0	94.0	94.5	93.4	91.1	90.1
1983	97.2	97.1	97.0	96.8	94.8	94.7
1984	100.0	99.5	99.9	99.4	99.6	99.1
1985	100.0	99.5	99.9	99.4	99.6	99.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.6	100.2	99.6	100.2	99.7	100.3
1988	101.1	101.4	101.1	101.5	100.7	100.9
1989	103.3	102.3	103.5	102.4	102.9	101.7
1990	100.5	99.9	100.5	99.9	99.3	98.5

Average annual growth rate (%) 1972-1990

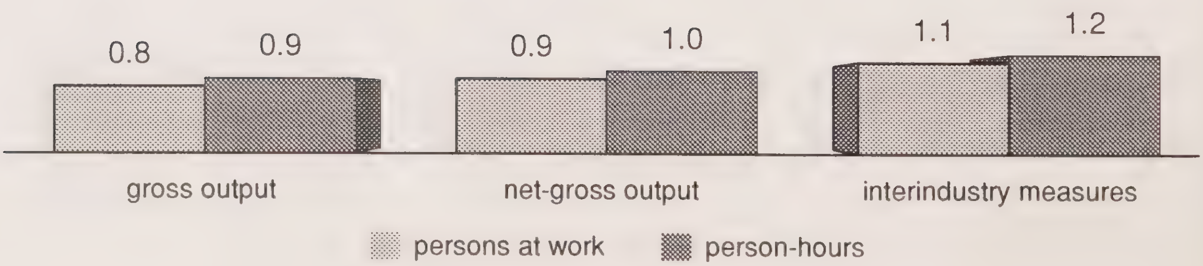


Table 15

Indices of multifactor productivity, primary textile & textile products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	79.1	78.2	74.9	73.8	78.0	76.5
1973	79.8	79.0	75.7	74.8	79.1	77.7
1974	79.8	79.2	75.7	75.0	78.4	77.3
1975	79.9	79.4	75.8	75.2	77.3	76.5
1976	81.9	81.5	78.1	77.7	80.4	79.8
1977	84.8	84.6	81.6	81.3	83.5	83.2
1978	88.4	88.1	85.9	85.5	87.7	87.2
1979	90.9	90.6	88.9	88.6	91.0	90.6
1980	90.8	90.8	88.8	88.9	90.1	90.0
1981	93.1	92.9	91.6	91.4	92.2	92.0
1982	88.6	88.3	86.1	85.7	85.4	85.2
1983	95.6	95.6	94.7	94.6	94.5	94.5
1984	95.9	96.0	95.0	95.2	96.0	96.1
1985	96.7	97.1	96.0	96.5	96.5	97.1
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.0	99.9	99.9	99.9	100.3	100.1
1988	98.4	98.2	98.0	97.8	98.5	98.1
1989	97.4	96.9	96.8	96.2	97.9	97.1
1990	95.9	95.9	95.1	95.0	95.5	95.3

Average annual growth rate (%) 1972-1990

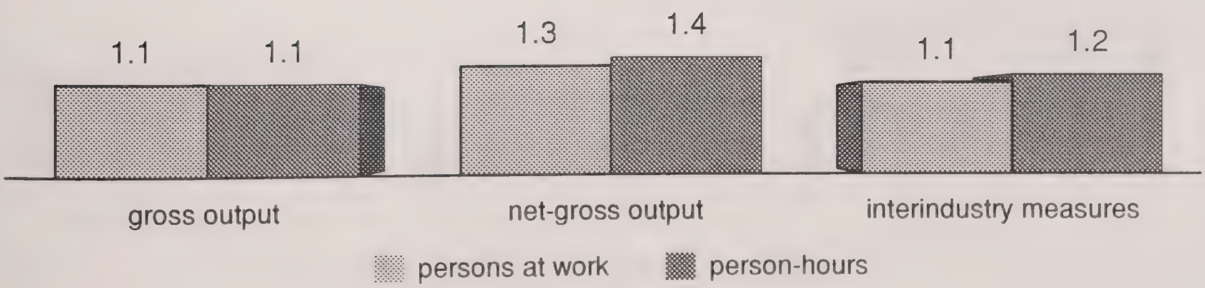


Table 16

Indices of multifactor productivity, clothing industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	85.1	84.5	84.5	83.9	77.3	76.1
1973	86.5	86.4	86.0	85.9	79.3	78.5
1974	86.7	86.5	86.2	86.0	79.4	78.6
1975	88.2	87.9	87.8	87.4	80.5	79.7
1976	90.5	90.2	90.1	89.9	83.5	82.9
1977	92.2	92.2	91.9	91.8	85.9	85.7
1978	95.6	95.6	95.4	95.4	90.7	90.3
1979	97.6	97.6	97.5	97.5	93.7	93.4
1980	96.8	97.4	96.7	97.2	93.0	93.3
1981	97.4	98.3	97.2	98.2	94.2	95.0
1982	94.2	95.6	93.9	95.4	88.5	89.9
1983	94.3	94.6	94.1	94.3	91.3	91.6
1984	97.2	97.2	97.1	97.1	95.1	95.2
1985	98.5	98.7	98.4	98.6	96.9	97.3
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.7	100.6	101.8	100.6	102.0	100.8
1988	99.0	98.5	99.0	98.5	98.7	98.1
1989	99.0	98.8	99.0	98.7	98.5	98.1
1990	98.7	98.1	98.6	98.0	96.9	96.2

Average annual growth rate (%) 1972-1990

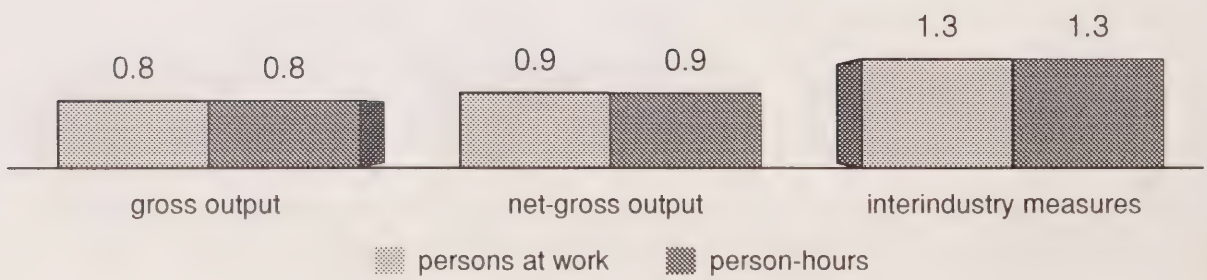


Table 17

Indices of multifactor productivity, wood industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	82.9	82.0	81.3	80.3	70.8	69.0
1973	83.4	82.5	81.9	80.9	71.5	69.6
1974	83.3	82.7	81.8	81.2	71.5	70.1
1975	81.7	81.2	80.0	79.4	67.5	66.5
1976	84.9	84.2	83.6	82.8	72.5	71.2
1977	87.3	86.8	86.3	85.6	75.0	74.4
1978	86.1	85.7	84.9	84.5	74.4	73.6
1979	86.0	85.6	84.8	84.3	74.5	74.1
1980	88.8	88.6	87.9	87.7	78.1	78.0
1981	89.1	90.4	88.2	89.5	78.0	79.4
1982	87.0	89.5	85.9	88.6	75.4	78.1
1983	92.2	93.1	91.5	92.4	84.2	85.6
1984	96.6	96.9	96.3	96.7	93.2	93.8
1985	100.0	100.1	100.0	100.1	98.0	98.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.6	102.6	102.9	102.8	105.7	105.3
1988	101.5	101.0	101.7	101.1	106.1	104.9
1989	99.3	99.0	99.2	98.9	103.8	103.3
1990	97.8	97.8	97.6	97.5	102.0	101.7

Average annual growth rate (%) 1972-1990

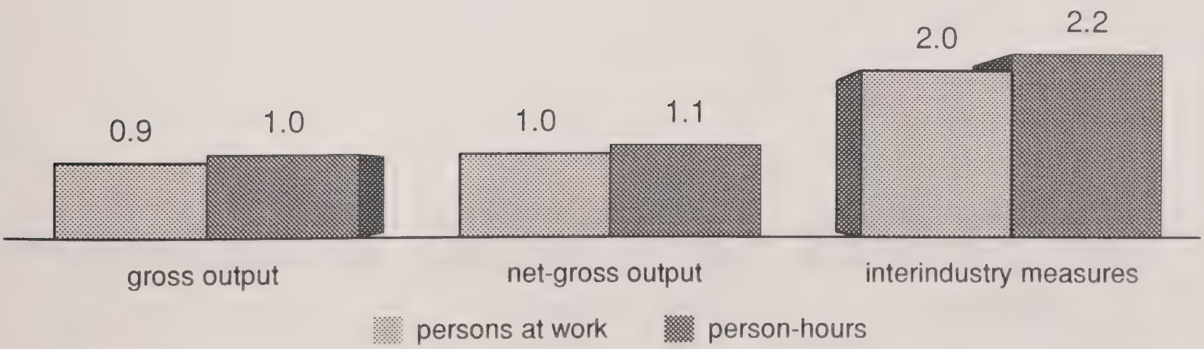


Table 18

Indices of multifactor productivity, furniture & fixture industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	103.8	102.5	103.9	102.6	98.5	96.2
1973	107.0	105.7	107.2	105.9	103.0	100.7
1974	97.8	96.6	97.8	96.5	93.5	91.6
1975	96.2	95.2	96.2	95.1	89.7	88.2
1976	101.5	100.2	101.6	100.2	96.2	94.4
1977	102.4	101.2	102.5	101.3	97.5	96.0
1978	106.4	105.3	106.6	105.5	102.1	100.6
1979	104.2	102.8	104.4	102.9	100.8	99.1
1980	102.3	101.5	102.4	101.6	98.6	97.5
1981	103.4	102.8	103.6	102.9	99.8	99.1
1982	93.5	93.1	93.3	92.9	87.1	87.0
1983	98.5	98.9	98.5	98.9	94.8	95.5
1984	101.0	101.0	101.1	101.1	99.7	99.8
1985	101.8	102.0	101.9	102.1	101.6	101.8
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	95.5	95.3	95.3	95.1	96.1	95.8
1988	92.8	92.7	92.5	92.4	93.5	93.1
1989	91.4	92.5	91.0	92.2	91.6	92.7
1990	91.4	91.9	91.0	91.6	90.6	91.0

Average annual growth rate (%) 1972-1990

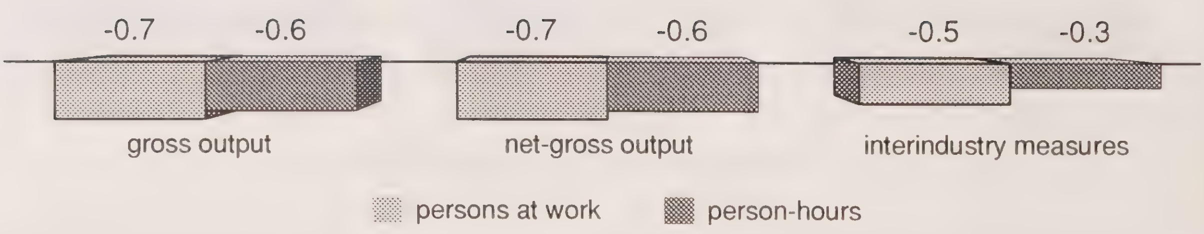


Table 19

Indices of multifactor productivity, paper & allied products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	99.1	98.4	99.1	98.3	92.9	91.5
1973	101.7	101.3	102.1	101.6	96.9	95.6
1974	103.6	103.3	104.3	103.9	98.4	97.3
1975	90.7	92.6	89.6	91.7	81.2	83.0
1976	98.0	98.6	97.7	98.4	90.9	91.2
1977	98.7	98.4	98.5	98.2	91.9	91.5
1978	102.1	100.3	102.3	100.3	96.0	93.5
1979	101.5	101.2	101.7	101.4	95.8	95.5
1980	101.6	100.1	101.8	100.1	95.6	93.7
1981	99.8	99.8	99.8	99.7	93.1	93.2
1982	94.0	94.1	93.2	93.3	84.9	85.4
1983	98.4	98.4	98.2	98.1	92.5	92.8
1984	99.7	99.6	99.6	99.5	97.2	97.3
1985	99.9	99.7	99.8	99.7	98.7	98.5
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.3	101.3	101.5	101.5	103.5	103.3
1988	99.9	99.7	99.8	99.6	102.5	101.8
1989	95.4	94.9	94.7	94.2	96.6	95.7
1990	91.8	91.7	90.7	90.5	91.3	90.9

Average annual growth rate (%) 1972-1990

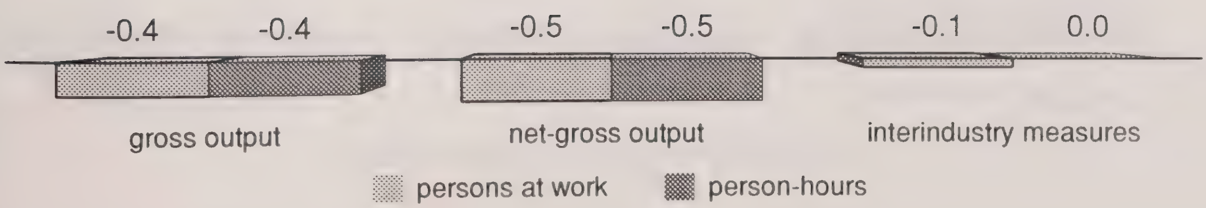


Table 20

Indices of multifactor productivity, printing, publishing & allied industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	88.8	86.9	88.1	86.1	85.4	82.9
1973	91.7	90.1	91.1	89.5	89.3	87.1
1974	91.1	89.8	90.5	89.2	88.7	86.9
1975	92.0	90.9	91.5	90.3	86.5	85.4
1976	96.6	95.7	96.4	95.5	93.1	92.1
1977	99.6	99.1	99.6	99.0	96.3	95.5
1978	101.9	101.0	102.1	101.1	99.8	98.2
1979	101.1	100.6	101.1	100.6	99.1	98.4
1980	101.4	100.5	101.5	100.5	99.4	98.0
1981	101.4	101.2	101.5	101.3	98.9	98.7
1982	96.8	96.5	96.6	96.3	91.9	91.8
1983	98.8	98.9	98.7	98.8	96.2	96.5
1984	101.6	101.4	101.7	101.5	100.7	100.7
1985	101.2	101.2	101.3	101.3	100.9	100.9
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	97.7	97.6	97.5	97.4	98.3	98.1
1988	97.6	97.2	97.4	96.9	98.1	97.5
1989	96.1	95.8	95.7	95.5	95.5	95.0
1990	93.2	92.7	92.6	92.1	91.0	90.4

Average annual growth rate (%) 1972-1990

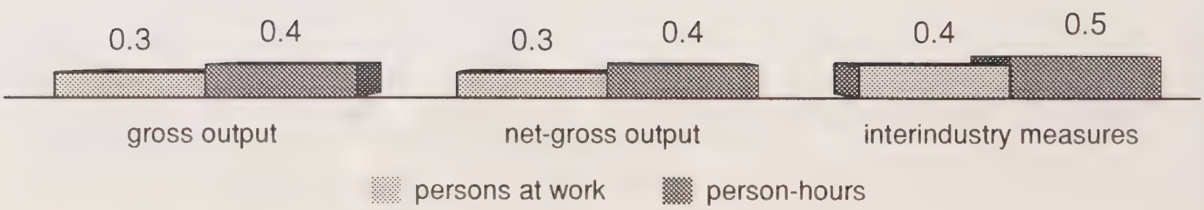


Table 21

Indices of multifactor productivity, primary metal industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	96.3	95.3	95.6	94.5	87.6	86.4
1973	98.3	97.2	97.8	96.6	95.1	93.3
1974	99.1	97.9	98.7	97.4	90.5	88.9
1975	96.0	95.7	95.2	94.9	85.7	85.1
1976	93.5	93.3	92.4	92.1	85.1	84.8
1977	96.7	96.3	96.0	95.6	88.0	87.4
1978	98.1	97.7	97.7	97.1	91.4	90.7
1979	94.6	94.0	93.7	92.9	87.2	86.5
1980	92.6	92.0	91.4	90.7	86.2	85.5
1981	95.2	94.9	94.3	93.9	85.6	85.1
1982	89.8	89.7	88.0	88.0	81.0	81.3
1983	94.5	94.5	93.6	93.6	87.1	87.1
1984	98.6	97.8	98.4	97.4	96.9	96.1
1985	100.8	100.9	100.9	101.1	100.8	100.8
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.4	102.4	102.8	102.8	107.1	106.7
1988	102.7	102.3	103.2	102.7	108.2	107.3
1989	102.5	102.4	102.9	102.8	104.9	104.1
1990	101.0	100.3	101.2	100.4	101.8	100.4

Average annual growth rate (%) 1972-1990

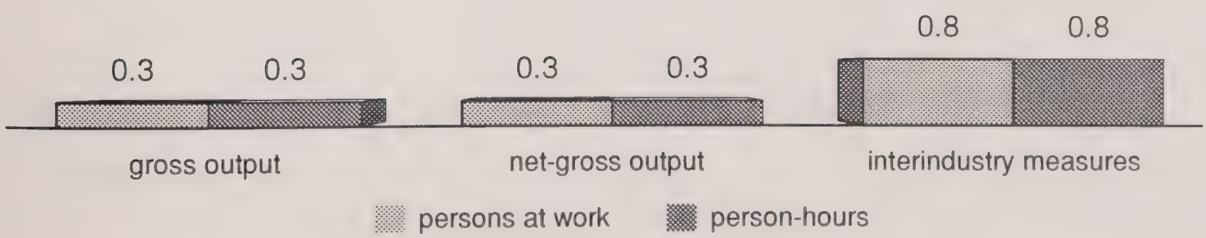


Table 22

Indices of multifactor productivity, fabricated metal products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	94.6	93.6	94.2	93.1	93.0	91.1
1973	97.0	96.1	96.8	95.8	97.8	96.0
1974	98.0	97.6	98.0	97.5	98.2	96.9
1975	94.5	94.1	94.1	93.7	91.9	91.1
1976	96.3	95.9	96.0	95.6	93.9	93.1
1977	96.8	96.4	96.6	96.2	94.8	94.1
1978	97.4	96.7	97.2	96.5	95.7	94.7
1979	94.4	94.2	94.0	93.8	92.8	92.2
1980	95.5	95.3	95.2	95.0	92.3	91.9
1981	97.2	97.1	97.1	97.0	93.9	93.7
1982	94.8	95.1	94.5	94.7	88.1	88.6
1983	96.1	96.6	95.8	96.3	92.4	93.2
1984	99.6	99.8	99.6	99.8	99.7	99.8
1985	101.4	101.3	101.5	101.4	102.4	102.4
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.5	99.4	99.5	99.4	100.2	99.9
1988	99.2	99.0	99.1	98.9	99.3	98.8
1989	98.7	98.9	98.6	98.8	98.6	98.8
1990	98.9	99.1	98.8	99.0	97.7	97.7

Average annual growth rate (%) 1972-1990

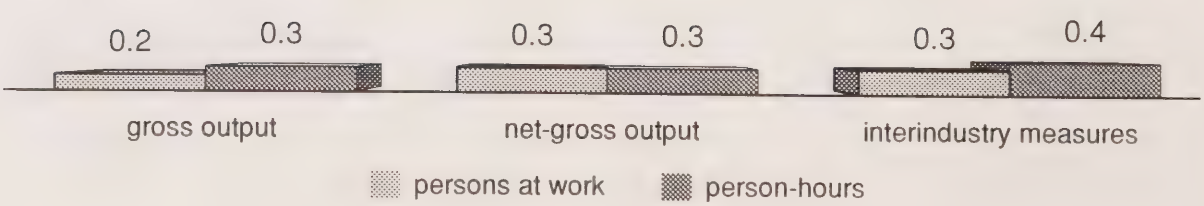


Table 23

Indices of multifactor productivity, machinery industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	97.3	96.6	97.2	96.4	95.6	94.1
1973	99.1	98.5	99.0	98.4	99.2	97.9
1974	100.2	100.0	100.2	100.0	100.3	99.3
1975	96.7	96.5	96.5	96.4	94.7	94.1
1976	97.2	97.1	97.1	97.0	95.8	95.3
1977	98.7	99.0	98.6	99.0	97.4	97.6
1978	100.9	100.9	101.0	100.9	99.7	99.4
1979	104.3	104.4	104.5	104.6	103.6	103.4
1980	102.6	102.9	102.8	103.1	101.1	101.1
1981	100.0	100.5	100.0	100.5	98.7	99.1
1982	92.2	92.8	91.7	92.4	88.3	89.0
1983	91.0	91.5	90.4	91.0	88.3	89.0
1984	98.3	98.4	98.2	98.3	97.4	97.5
1985	99.6	99.7	99.6	99.7	99.5	99.6
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	97.8	97.5	97.7	97.4	98.3	97.9
1988	99.0	99.0	98.9	98.9	99.9	99.7
1989	97.8	97.9	97.7	97.8	98.6	98.7
1990	96.6	96.4	96.4	96.2	96.7	96.4

Average annual growth rate (%) 1972-1990

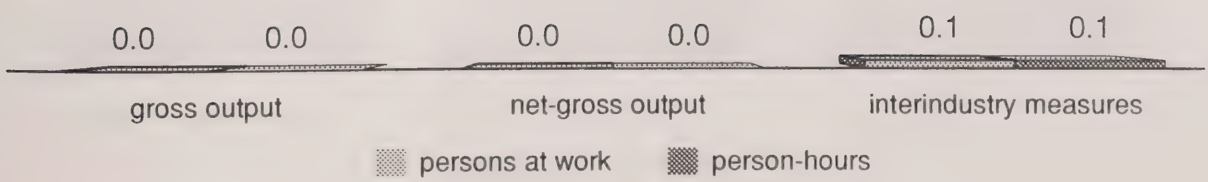


Table 24

Indices of multifactor productivity, transportation equipment industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	91.0	91.2	90.3	90.4	88.6	88.1
1973	94.6	94.7	94.1	94.2	93.5	92.9
1974	95.0	95.5	94.5	95.1	93.6	93.6
1975	96.9	97.3	96.6	97.1	94.3	94.4
1976	97.9	98.6	97.7	98.4	95.9	96.3
1977	99.0	99.3	98.8	99.2	97.1	97.3
1978	98.7	99.6	98.5	99.5	97.1	97.7
1979	98.1	99.4	97.9	99.3	96.7	97.9
1980	92.5	93.8	91.9	93.4	90.4	91.7
1981	93.9	95.2	93.4	94.8	92.0	93.3
1982	92.6	94.2	92.1	93.7	89.0	90.7
1983	95.8	96.7	95.5	96.5	93.8	94.9
1984	99.8	100.1	99.8	100.2	99.5	99.8
1985	101.0	101.3	101.1	101.3	101.1	101.4
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	98.6	98.3	98.5	98.2	98.9	98.5
1988	99.9	99.8	100.0	99.8	100.7	100.4
1989	99.8	100.4	99.8	100.4	100.2	100.8
1990	97.6	98.6	97.3	98.5	97.0	98.1

Average annual growth rate (%) 1972-1990

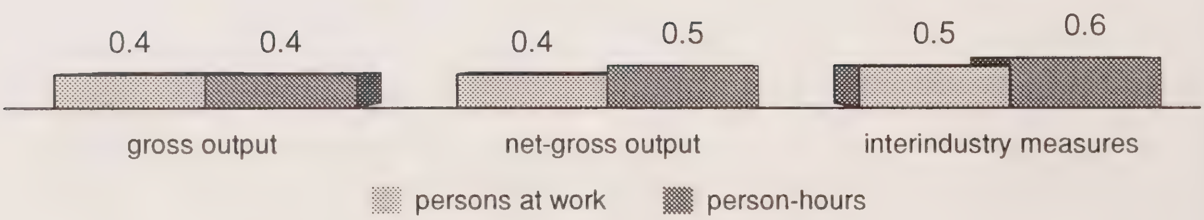


Table 25

Indices of multifactor productivity, electrical & electronic products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	77.4	76.8	75.6	74.9	70.7	69.6
1973	80.9	80.2	79.4	78.6	75.1	74.0
1974	80.6	80.0	79.1	78.4	75.2	74.2
1975	79.0	78.6	77.3	76.9	72.7	72.0
1976	82.0	81.8	80.6	80.3	76.4	76.0
1977	84.8	84.6	83.6	83.4	79.1	78.8
1978	84.1	83.7	82.8	82.5	78.4	77.8
1979	90.0	89.7	89.2	88.9	85.9	85.5
1980	93.3	93.3	92.8	92.8	90.3	90.1
1981	94.3	94.3	93.9	93.9	91.4	91.4
1982	90.9	90.9	90.2	90.2	87.2	87.4
1983	91.2	91.1	90.6	90.5	88.5	88.5
1984	97.1	97.4	96.9	97.2	96.8	97.2
1985	99.1	98.7	99.0	98.6	98.9	98.6
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.2	100.9	101.2	100.9	101.9	101.5
1988	103.1	103.1	103.3	103.3	104.4	104.4
1989	104.8	104.6	105.2	105.0	106.5	106.3
1990	106.2	105.9	106.7	106.4	107.5	107.1

Average annual growth rate (%) 1972-1990

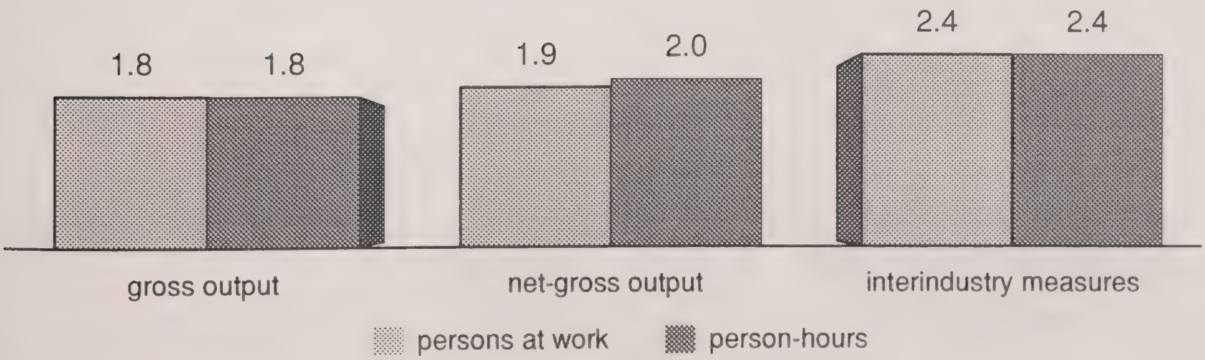


Table 26

Indices of multifactor productivity, non-metallic mineral products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	107.1	105.6	108.2	106.5	92.6	90.6
1973	101.5	100.4	101.9	100.7	96.3	94.4
1974	97.5	96.7	97.4	96.5	94.9	93.5
1975	94.7	94.0	94.2	93.4	91.8	90.6
1976	95.5	95.0	95.1	94.6	94.2	93.5
1977	94.6	94.1	94.1	93.6	92.5	91.9
1978	96.0	95.6	95.7	95.2	95.5	94.8
1979	96.4	96.0	96.2	95.7	96.6	96.0
1980	90.7	90.9	89.7	90.0	88.7	88.8
1981	90.1	90.5	89.1	89.5	86.7	86.9
1982	84.5	85.1	82.8	83.5	78.9	79.6
1983	90.0	90.3	89.0	89.2	87.3	87.6
1984	94.5	94.5	93.9	94.0	94.3	94.4
1985	98.3	98.4	98.1	98.2	97.6	97.6
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.3	102.0	102.6	102.2	105.2	104.6
1988	102.4	101.8	102.6	102.0	106.7	105.7
1989	100.2	99.6	100.2	99.5	103.0	102.4
1990	95.0	94.7	94.5	94.2	96.8	96.5

Average annual growth rate (%) 1972-1990

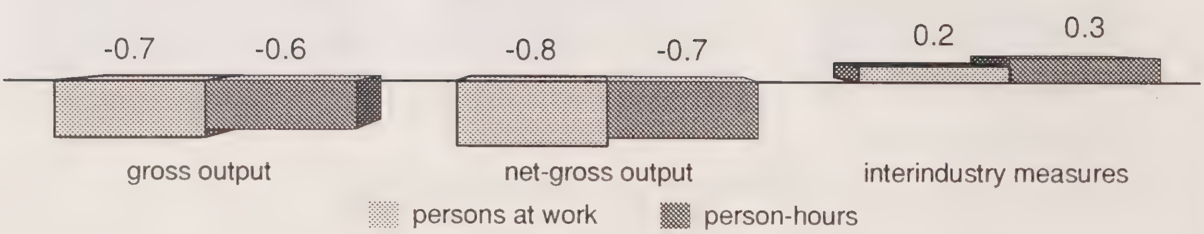


Table 27

Indices of multifactor productivity, refined petroleum & coal products (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	92.8	92.7	92.6	92.5	130.2	129.2
1973	96.3	96.3	96.2	96.2	138.7	137.9
1974	95.7	95.8	95.7	95.7	134.4	133.7
1975	96.3	96.4	96.2	96.4	127.5	127.2
1976	95.7	95.9	95.6	95.8	122.3	121.9
1977	98.7	98.8	98.6	98.8	123.1	123.1
1978	96.5	96.7	96.4	96.6	114.4	114.4
1979	95.2	95.3	95.1	95.2	115.0	114.8
1980	95.6	95.8	95.5	95.7	106.5	106.4
1981	97.7	97.9	97.7	97.8	102.5	102.4
1982	100.0	100.2	100.0	100.2	101.2	101.1
1983	101.6	101.6	101.7	101.6	103.4	103.2
1984	102.2	102.2	102.3	102.2	105.3	105.1
1985	101.1	101.0	101.2	101.1	104.8	104.5
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.8	100.7	100.9	100.8	105.0	104.8
1988	101.0	101.1	101.0	101.1	110.9	110.6
1989	100.8	100.8	100.8	100.8	109.6	109.3
1990	101.8	101.8	101.9	101.9	111.3	111.0

Average annual growth rate (%) 1972-1990

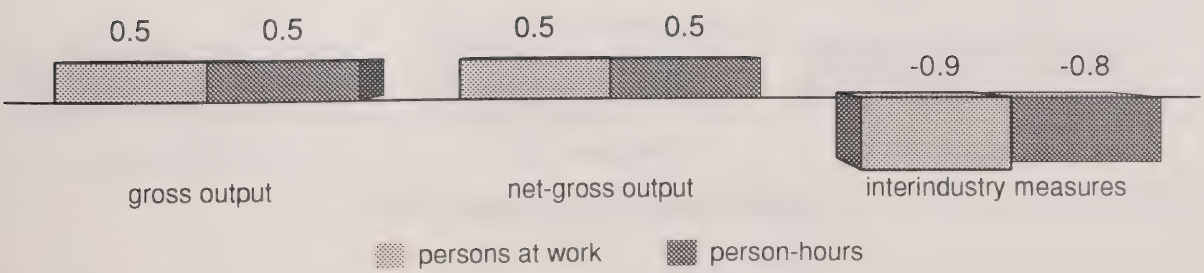


Table 28

Indices of multifactor productivity, chemical & chemical products industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	87.5	87.3	85.4	85.2	87.2	86.2
1973	91.2	91.1	89.6	89.4	92.2	91.2
1974	91.1	91.1	89.4	89.4	92.1	91.4
1975	86.2	86.1	83.8	83.7	86.1	85.5
1976	88.8	89.7	86.8	87.8	89.4	89.9
1977	89.2	89.2	87.3	87.2	90.8	90.5
1978	91.7	91.6	90.1	89.9	93.1	92.6
1979	93.5	93.7	92.2	92.4	95.5	95.3
1980	91.0	91.2	89.2	89.5	91.3	91.2
1981	93.7	94.0	92.5	92.9	94.5	94.7
1982	88.5	88.9	86.2	86.7	86.9	87.5
1983	95.5	95.6	94.6	94.6	93.7	93.9
1984	98.6	98.6	98.3	98.3	98.3	98.4
1985	99.5	99.6	99.4	99.5	100.1	100.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.6	101.7	101.9	102.0	102.6	102.6
1988	103.1	103.0	103.8	103.7	104.5	104.1
1989	104.6	104.4	105.6	105.3	105.5	105.2
1990	103.3	103.1	104.0	103.8	103.1	102.7

Average annual growth rate (%) 1972-1990

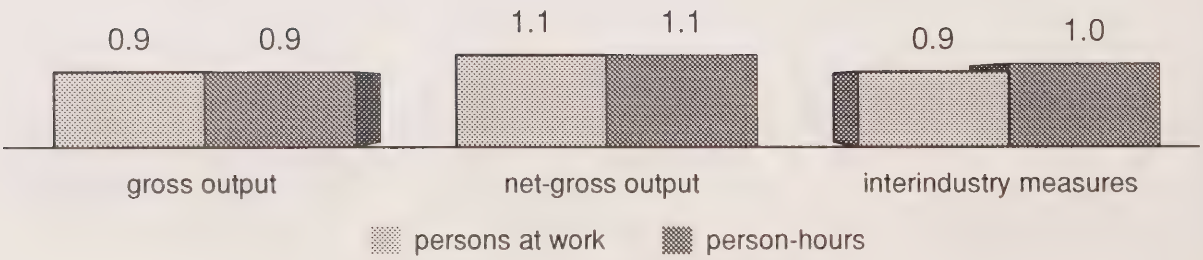
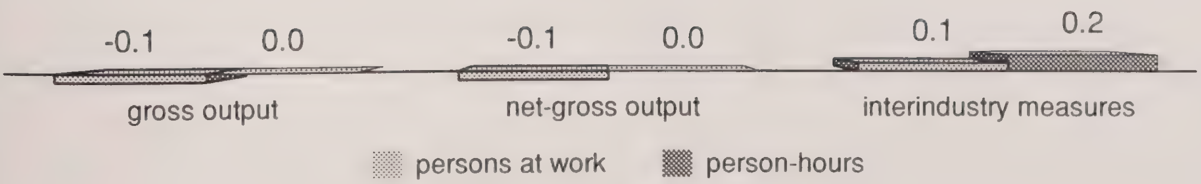


Table 29

Indices of multifactor productivity, other manufacturing industries (1986=100)

Year	Industry measures				Interindustry measures	
	Gross output		Net-gross output			
	Persons at work	Person-hours	Persons at work	Person-hours	Persons at work	Person-hours
1972	99.3	98.0	99.2	97.9	96.0	94.0
1973	101.1	100.1	101.1	100.1	99.3	97.6
1974	100.5	99.4	100.5	99.3	97.6	95.9
1975	98.6	97.7	98.5	97.6	94.0	92.7
1976	103.5	103.0	103.6	103.1	100.0	99.2
1977	104.2	103.8	104.4	104.0	100.2	99.5
1978	104.9	104.6	105.2	104.8	101.5	100.8
1979	103.5	103.1	103.7	103.3	100.8	100.1
1980	101.2	101.0	101.3	101.0	98.7	98.3
1981	102.6	102.4	102.7	102.5	100.1	99.8
1982	102.0	102.2	102.1	102.3	97.5	97.8
1983	101.6	101.6	101.7	101.6	98.7	98.8
1984	105.4	105.0	105.7	105.3	104.8	104.4
1985	106.1	105.4	106.4	105.6	105.8	105.2
1986	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.0	101.5	101.1	101.6	101.9	102.2
1988	98.9	99.4	98.9	99.4	100.7	101.0
1989	98.8	98.3	98.8	98.3	100.7	100.1
1990	98.2	97.8	98.2	97.7	98.1	97.5

Average annual growth rate (%) 1972-1990



PART 2

Labour Productivity

Labour Compensation

Unit Labour Cost

Table 1

Indices of labour productivity and unit labour cost, business sector industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compen-sation	Labour productivity		Compen-sation per person	Compen-sation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1972	61.2	71.6	76.5	22.2	85.5	80.0	31.1	29.1	36.3
1973	66.7	75.3	80.5	25.9	88.6	82.8	34.4	32.2	38.8
1974	69.0	79.0	83.9	30.7	87.3	82.2	38.9	36.6	44.6
1975	69.3	80.2	84.6	35.4	86.4	81.9	44.1	41.8	51.0
1976	74.0	81.5	85.3	40.7	90.8	86.7	49.9	47.7	55.0
1977	76.4	83.3	85.9	45.1	91.7	88.9	54.2	52.5	59.1
1978	78.9	85.9	88.9	49.2	92.0	88.8	57.3	55.3	62.3
1979	82.4	89.5	92.1	55.5	92.1	89.5	62.0	60.2	67.3
1980	83.8	91.4	93.5	62.7	91.7	89.7	68.6	67.1	74.8
1981	87.5	94.2	95.4	72.4	92.8	91.7	76.8	75.8	82.7
1982	82.6	91.3	90.9	75.8	90.4	90.9	83.0	83.4	91.8
1983	85.5	91.3	90.4	79.1	93.7	94.6	86.6	87.5	92.5
1984	91.5	93.7	93.4	85.9	97.7	98.0	91.7	92.0	93.9
1985	96.6	98.1	98.1	93.6	98.5	98.5	95.5	95.4	96.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.0	103.2	104.0	110.0	101.7	101.0	106.5	105.8	104.8
1988	110.1	107.2	108.2	121.7	102.7	101.8	113.4	112.5	110.4
1989	112.8	109.6	109.7	131.6	102.9	102.8	120.1	120.0	116.7
1990	111.5	109.8	109.8	137.2	101.5	101.5	124.9	124.9	123.0
1991	109.0	106.8	105.6	138.6	102.0	103.2	129.8	131.3	127.2
1992	109.6	105.5	104.1	141.8	103.9	105.3	134.4	136.2	129.4

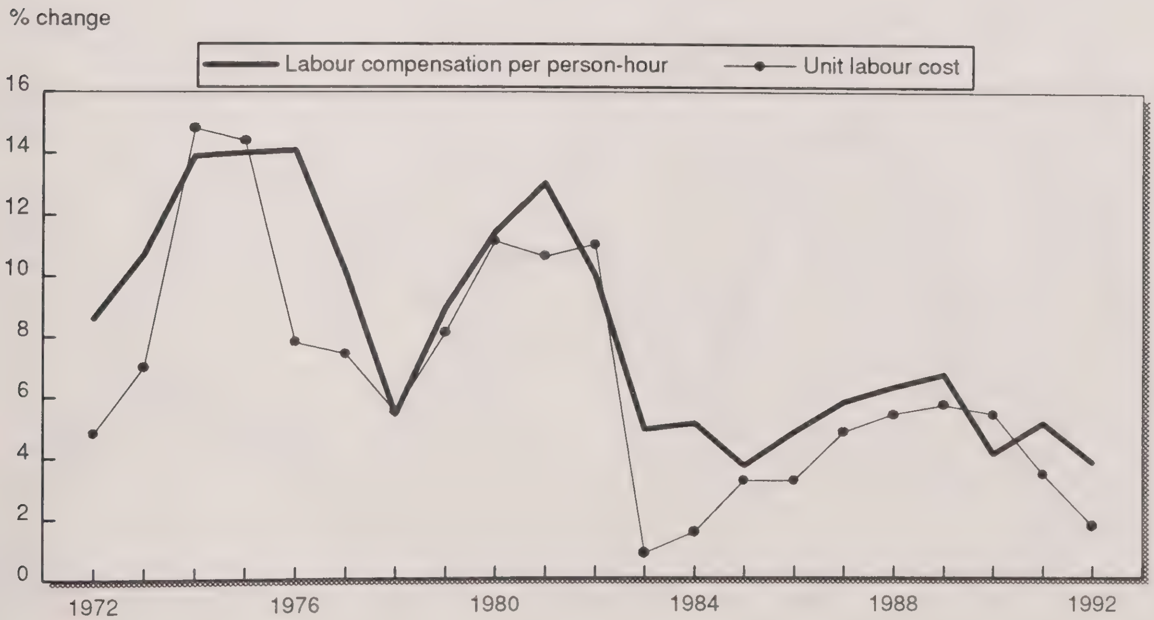


Table 2

Indices of labour productivity and unit labour cost, business sector-excluding agricultural & related services industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	60.9	70.1	74.3	22.2	86.8	82.0	31.6	29.8	36.4
1973	66.3	74.2	78.6	25.7	89.3	84.4	34.7	32.8	38.8
1974	68.9	78.1	82.1	30.6	88.3	83.9	39.2	37.3	44.4
1975	68.9	79.0	82.3	35.2	87.3	83.7	44.6	42.8	51.1
1976	73.6	80.5	83.4	40.7	91.4	88.2	50.5	48.7	55.3
1977	76.1	82.5	84.5	45.1	92.2	90.0	54.7	53.4	59.3
1978	78.8	85.0	87.6	49.1	92.6	90.0	57.7	56.0	62.3
1979	82.6	88.8	90.9	55.5	93.0	90.9	62.5	61.0	67.2
1980	83.9	90.9	92.7	62.8	92.3	90.5	69.1	67.8	74.9
1981	87.4	93.8	94.7	72.3	93.2	92.3	77.1	76.4	82.7
1982	82.0	90.9	90.1	75.7	90.2	91.1	83.2	84.0	92.3
1983	85.2	90.6	89.6	79.0	94.0	95.1	87.1	88.2	92.7
1984	91.6	93.2	92.8	85.9	98.3	98.7	92.1	92.5	93.7
1985	97.1	97.9	97.8	93.5	99.3	99.4	95.6	95.7	96.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.5	103.5	104.4	110.2	101.9	101.0	106.5	105.6	104.5
1988	111.0	108.0	109.3	121.9	102.8	101.5	113.0	111.5	109.9
1989	113.4	110.6	111.1	132.1	102.6	102.1	119.4	118.8	116.4
1990	111.7	110.9	111.2	137.6	100.7	100.4	124.0	123.7	123.2
1991	109.1	107.7	106.7	139.0	101.3	102.3	129.1	130.3	127.4
1992	110.0	106.5	105.3	142.3	103.3	104.4	133.7	135.2	129.4

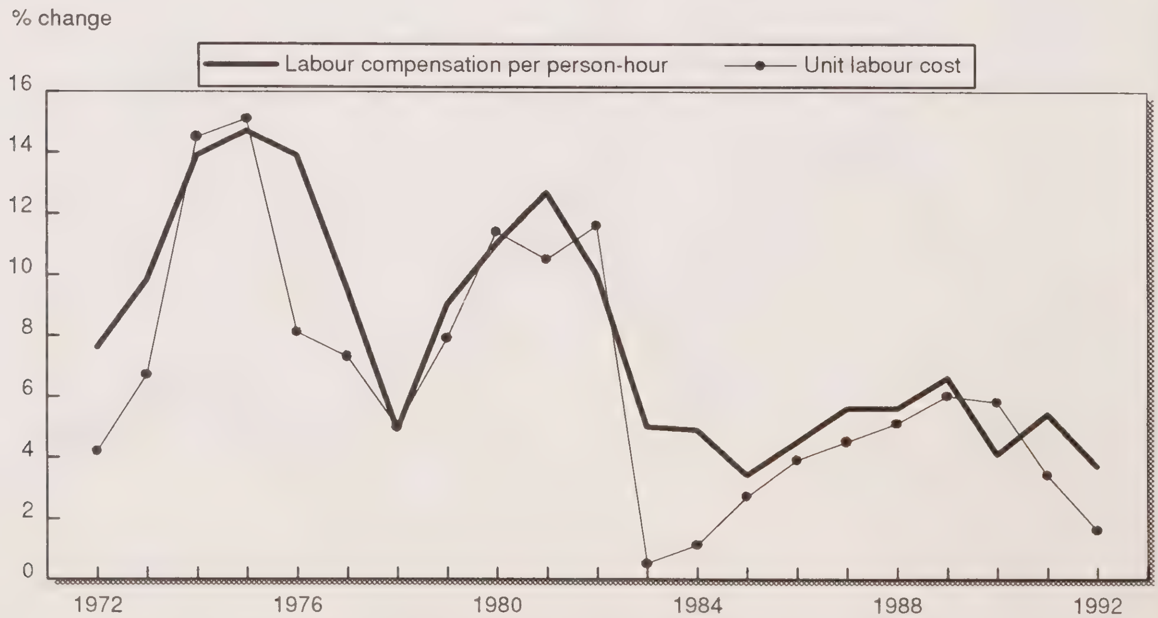


Table 3

Indices of labour productivity and unit labour cost, business sector-services (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	54.2	59.6	63.6	19.8	91.0	85.2	33.2	31.1	36.5
1973	58.3	63.4	67.7	22.9	92.1	86.2	36.1	33.8	39.2
1974	61.8	67.7	71.8	27.4	91.2	86.0	40.4	38.1	44.3
1975	64.4	70.1	73.8	32.0	91.9	87.3	45.6	43.4	49.7
1976	68.0	71.6	74.8	36.9	94.9	90.8	51.6	49.4	54.3
1977	70.0	74.9	77.0	41.2	93.5	91.0	55.0	53.5	58.8
1978	73.7	78.1	80.8	45.2	94.4	91.2	57.9	55.9	61.3
1979	77.9	81.7	83.8	51.4	95.3	92.9	63.0	61.3	66.0
1980	81.3	84.9	86.8	59.0	95.7	93.7	69.5	67.9	72.5
1981	84.8	88.9	90.0	67.5	95.4	94.2	76.0	75.0	79.6
1982	81.0	88.5	88.2	73.3	91.6	91.9	82.9	83.1	90.5
1983	83.3	89.1	88.0	77.2	93.4	94.7	86.6	87.7	92.6
1984	89.2	92.3	91.7	84.9	96.6	97.2	91.9	92.6	95.2
1985	94.6	97.6	97.2	93.0	97.0	97.3	95.3	95.6	98.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.8	103.6	104.2	111.0	102.1	101.5	107.1	106.5	104.9
1988	111.6	107.7	108.5	122.7	103.6	102.8	113.9	113.0	109.9
1989	115.2	110.5	110.5	134.4	104.3	104.3	121.6	121.7	116.6
1990	114.4	112.8	113.0	142.3	101.5	101.3	126.2	125.9	124.4
1991	113.3	111.6	110.3	146.7	101.6	102.8	131.5	133.0	129.4
1992	115.8	111.6	110.3	151.9	103.7	105.0	136.0	137.6	131.1

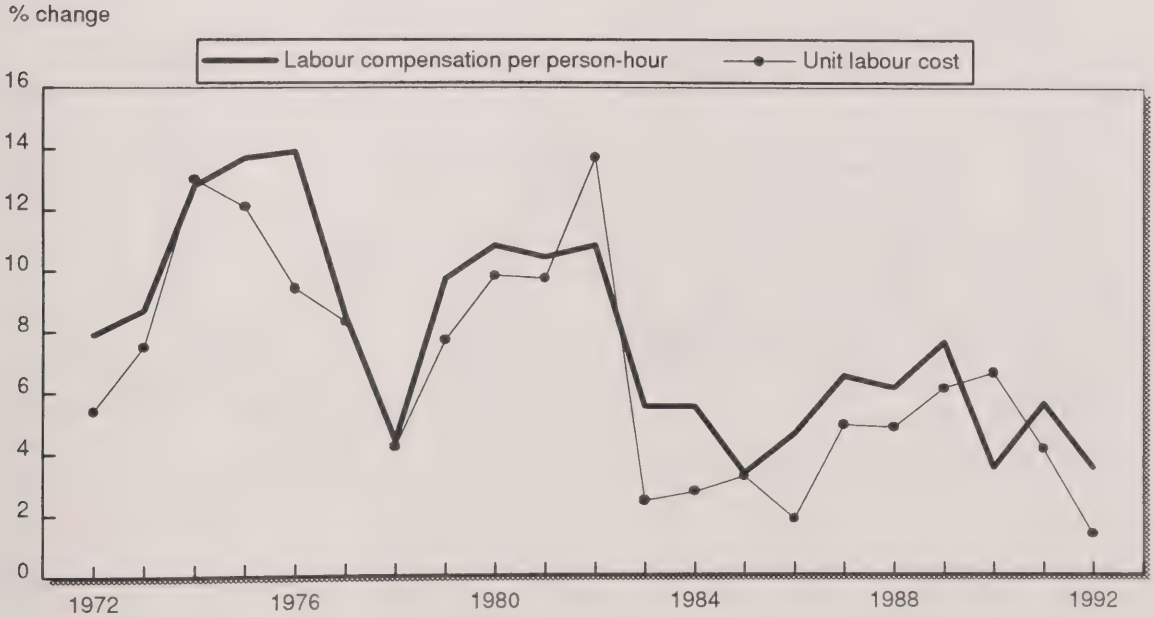


Table 4

Indices of labour productivity and unit labour cost, business sector-goods (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1972	69.1	90.7	94.9	25.4	76.2	72.8	28.0	26.8	36.8
1973	76.2	94.3	98.9	29.8	80.8	77.0	31.6	30.2	39.1
1974	77.0	96.9	101.2	35.1	79.4	76.1	36.2	34.7	45.6
1975	74.6	96.3	100.0	39.7	77.5	74.6	41.2	39.7	53.2
1976	80.6	97.1	100.3	45.5	83.0	80.4	46.9	45.4	56.4
1977	83.5	96.7	98.8	50.2	86.3	84.5	51.9	50.8	60.1
1978	84.6	98.1	100.3	54.3	86.2	84.3	55.3	54.1	64.1
1979	87.3	101.9	104.0	60.7	85.7	83.9	59.6	58.4	69.6
1980	86.2	101.8	102.9	67.5	84.7	83.8	66.4	65.6	78.3
1981	90.0	102.7	103.2	78.5	87.6	87.2	76.5	76.1	87.3
1982	84.0	95.9	94.7	79.0	87.7	88.8	82.4	83.4	94.0
1983	87.5	94.6	93.8	81.5	92.5	93.3	86.1	86.9	93.1
1984	93.7	95.8	95.8	87.3	97.8	97.8	91.0	91.1	93.1
1985	98.5	98.8	99.4	94.5	99.7	99.0	95.6	95.0	95.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.1	102.6	103.6	108.6	101.5	100.4	105.9	104.8	104.4
1988	108.6	106.6	107.7	120.4	101.9	100.9	113.0	111.8	110.8
1989	110.1	108.1	108.6	128.0	101.9	101.4	118.5	117.9	116.3
1990	108.3	105.1	105.3	130.6	103.0	102.9	124.2	124.0	120.5
1991	104.3	99.2	98.9	128.2	105.1	105.5	129.2	129.7	123.0
1992	103.0	95.9	95.2	128.9	107.5	108.3	134.5	135.5	125.2

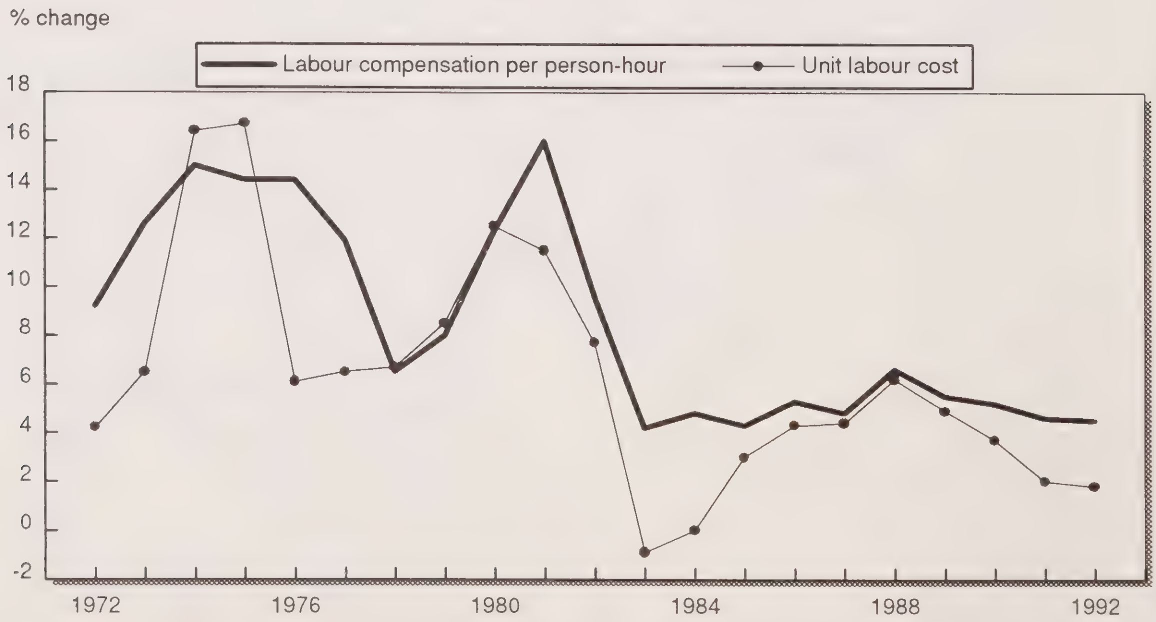


Table 5

Indices of labour productivity and unit labour cost, agricultural & related services industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	72.2	95.6	105.7	25.0	75.5	68.3	26.1	23.6	34.6
1973	79.3	92.9	105.7	32.4	85.4	75.0	34.9	30.6	40.8
1974	69.6	94.1	107.5	35.3	74.0	64.8	37.6	32.9	50.8
1975	81.3	100.3	114.5	40.1	81.0	71.0	40.0	35.0	49.3
1976	88.5	97.9	110.3	41.8	90.4	80.2	42.7	37.9	47.3
1977	87.5	96.8	105.0	46.1	90.4	83.3	47.6	43.9	52.6
1978	83.8	99.1	105.8	53.5	84.6	79.2	54.0	50.6	63.9
1979	77.0	100.8	108.7	56.9	76.3	70.8	56.4	52.4	73.9
1980	81.5	100.3	103.9	60.3	81.3	78.5	60.2	58.0	74.0
1981	88.9	101.9	105.2	75.3	87.2	84.5	73.9	71.6	84.8
1982	94.5	97.5	101.0	80.0	96.9	93.5	82.1	79.2	84.7
1983	91.7	101.7	101.1	82.9	90.2	90.7	81.5	82.0	90.4
1984	88.8	101.5	100.9	88.6	87.4	88.0	87.3	87.8	99.8
1985	85.1	101.4	103.2	98.7	83.9	82.5	97.3	95.7	116.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	90.1	98.1	97.9	99.1	91.9	92.1	100.9	101.2	109.9
1988	85.5	95.4	92.7	109.8	89.6	92.2	115.2	118.5	128.5
1989	92.5	92.4	90.9	113.0	100.1	101.8	122.3	124.3	122.2
1990	106.0	91.8	91.7	121.1	115.5	115.6	131.9	132.1	114.3
1991	104.9	91.7	91.5	122.7	114.3	114.6	133.7	134.0	117.0
1992	99.7	89.9	88.3	120.6	110.9	113.0	134.2	136.7	121.0

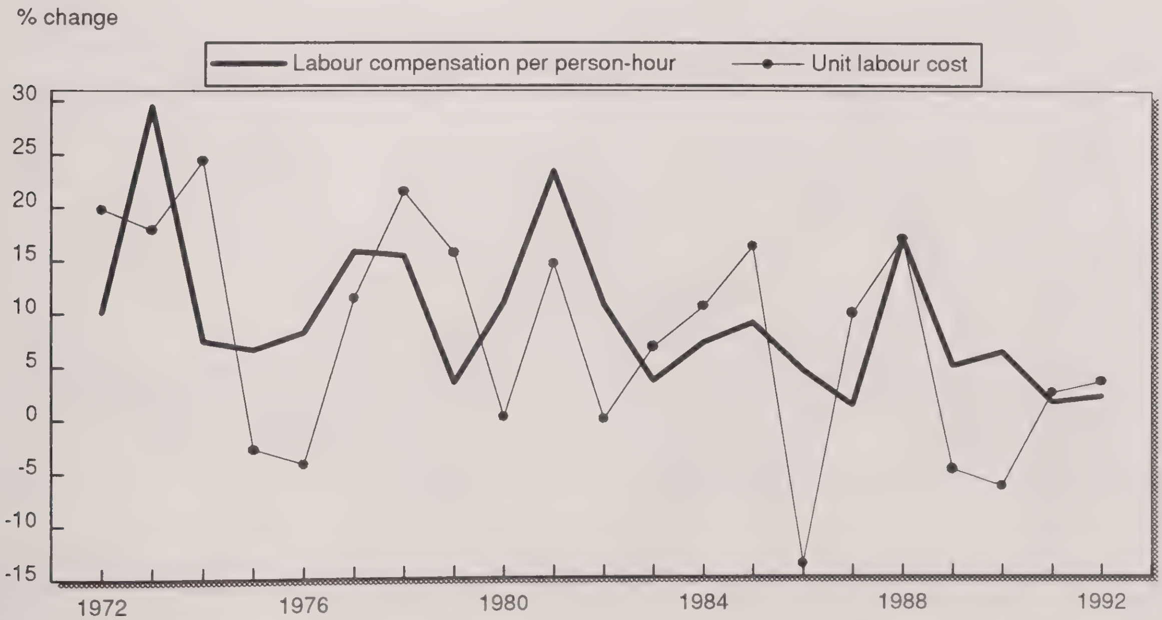


Table 6

Indices of labour productivity and unit labour cost, manufacturing industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compen-sation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compen-sation per person	Compen-sation per person-hour	Unit labour cost
1972	70.6	93.5	96.3	26.3	75.5	73.3	28.2	27.3	37.3
1973	78.2	97.8	100.3	29.7	79.9	77.9	30.4	29.6	38.0
1974	80.5	99.8	101.7	34.6	80.7	79.2	34.7	34.1	43.0
1975	75.1	97.5	98.3	38.3	77.1	76.5	39.3	38.9	50.9
1976	80.6	97.9	98.6	43.9	82.3	81.8	44.8	44.6	54.5
1977	83.6	95.9	96.8	47.7	87.1	86.3	49.8	49.3	57.1
1978	87.4	98.9	100.1	53.2	88.3	87.3	53.7	53.1	60.8
1979	90.6	102.5	102.9	60.2	88.4	88.1	58.7	58.5	66.4
1980	86.6	102.2	102.2	66.2	84.7	84.7	64.8	64.8	76.4
1981	89.8	102.2	101.0	75.3	87.8	88.9	73.7	74.5	83.9
1982	78.2	94.3	92.2	75.9	82.9	84.8	80.6	82.4	97.1
1983	83.2	92.4	91.5	79.9	90.1	91.0	86.6	87.4	96.1
1984	94.0	95.2	95.2	87.2	98.7	98.7	91.6	91.5	92.8
1985	99.3	97.6	97.7	94.1	101.7	101.6	96.4	96.3	94.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.8	103.0	103.9	107.0	101.7	100.9	103.8	103.0	102.0
1988	110.2	107.5	108.7	116.8	102.4	101.4	108.6	107.5	106.1
1989	111.1	108.8	109.2	121.8	102.1	101.8	111.9	111.6	109.6
1990	107.5	103.2	103.4	122.1	104.2	104.0	118.3	118.1	113.6
1991	101.2	95.8	95.9	120.7	105.6	105.5	125.9	125.8	119.2
1992	101.4	91.8	92.6	122.4	110.5	109.5	133.3	132.2	120.7

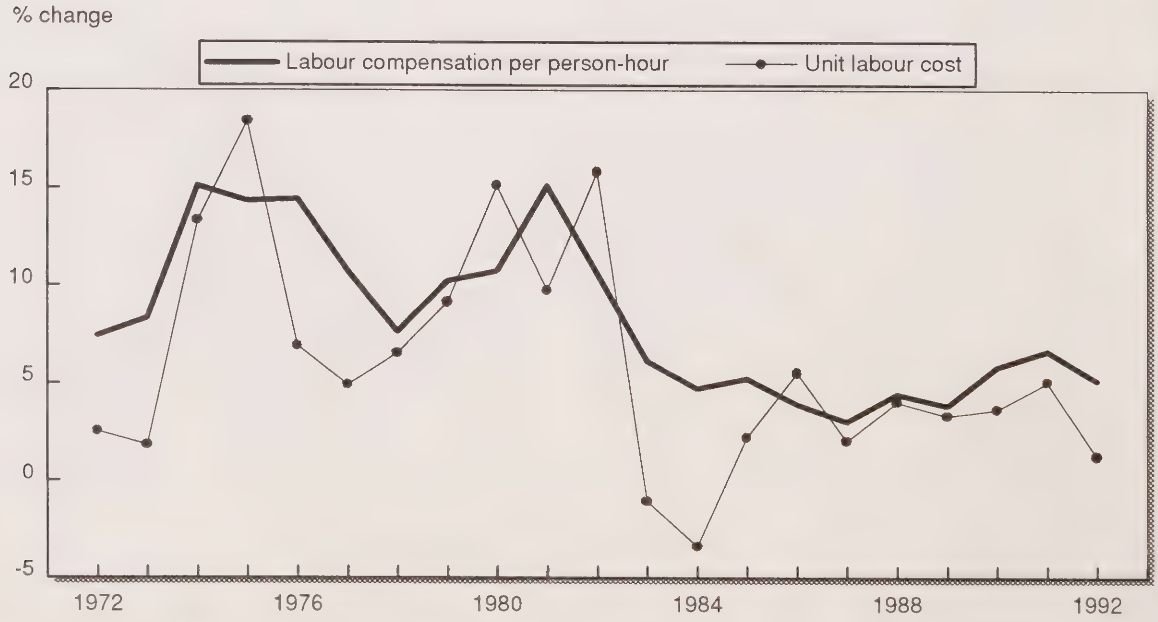


Table 7

Indices of labour productivity and unit labour cost, construction industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	61.7	85.8	89.4	26.2	71.9	69.0	30.5	29.3	42.5
1973	63.5	91.4	95.6	32.7	69.5	66.5	35.8	34.2	51.5
1974	65.5	96.4	100.8	39.6	68.0	65.0	41.1	39.3	60.5
1975	72.7	94.8	98.5	47.1	76.7	73.8	49.7	47.8	64.8
1976	81.9	99.9	102.8	54.6	82.0	79.6	54.7	53.1	66.7
1977	86.1	101.4	101.7	60.5	84.9	84.6	59.7	59.5	70.3
1978	81.8	98.5	100.0	59.7	83.0	81.8	60.6	59.7	73.0
1979	82.6	103.2	105.4	63.7	80.1	78.4	61.7	60.4	77.0
1980	86.8	101.5	104.3	72.7	85.5	83.3	71.7	69.8	83.8
1981	96.7	103.2	105.0	88.4	93.7	92.1	85.6	84.2	91.4
1982	96.8	96.7	93.0	84.9	100.1	104.0	87.9	91.3	87.8
1983	95.1	93.3	91.0	83.4	101.9	104.4	89.4	91.7	87.8
1984	89.1	91.4	90.6	84.6	97.5	98.3	92.6	93.4	95.0
1985	96.0	98.4	99.3	92.0	97.6	96.7	93.5	92.7	95.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.7	105.8	109.5	117.6	99.9	96.5	111.1	107.4	111.2
1988	109.7	113.6	118.9	134.8	96.6	92.3	118.7	113.4	122.9
1989	115.7	119.7	124.4	151.3	96.7	93.0	126.4	121.6	130.7
1990	115.7	121.9	123.1	157.2	95.0	94.0	129.0	127.7	135.8
1991	110.7	113.1	112.2	147.7	97.9	98.7	130.6	131.6	133.4
1992	103.4	111.1	108.3	146.3	93.1	95.4	131.7	135.1	141.5

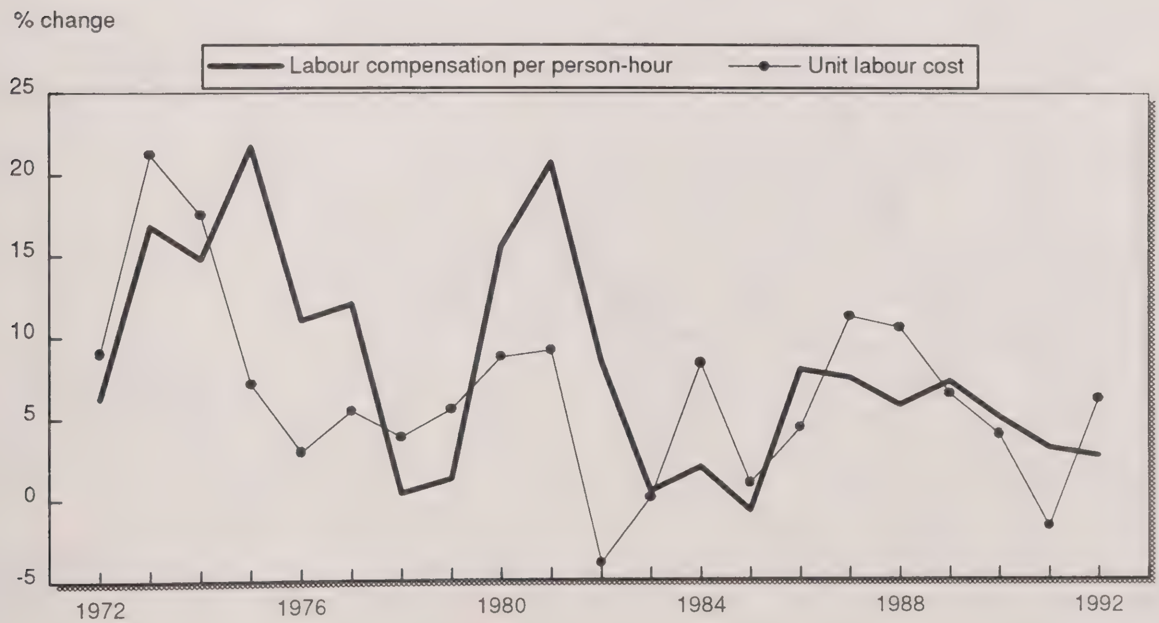


Table 8

Indices of labour productivity and unit labour cost, transportation & storage industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1972	66.2	81.7	83.7	24.1	81.0	79.1	29.5	28.8	36.4
1973	70.6	84.5	86.8	27.1	83.6	81.3	32.1	31.2	38.4
1974	73.7	89.6	91.8	32.4	82.3	80.3	36.2	35.3	44.0
1975	72.6	88.6	89.4	37.7	81.9	81.2	42.5	42.1	51.9
1976	72.1	87.8	88.6	42.1	82.1	81.4	48.0	47.5	58.4
1977	75.2	93.2	93.0	47.9	80.7	80.9	51.4	51.5	63.7
1978	79.0	95.2	96.1	53.0	83.0	82.2	55.7	55.2	67.1
1979	88.4	98.2	98.4	59.3	90.0	89.8	60.4	60.2	67.1
1980	85.3	102.7	103.7	66.9	83.0	82.3	65.1	64.5	78.4
1981	84.3	104.2	103.0	75.8	80.9	81.8	72.8	73.6	89.9
1982	79.6	98.7	96.8	79.8	80.6	82.2	80.8	82.4	100.2
1983	85.5	94.1	90.7	81.9	90.8	94.2	87.0	90.3	95.8
1984	95.6	96.4	95.3	89.3	99.1	100.3	92.7	93.8	93.5
1985	97.6	97.0	96.5	95.3	100.6	101.1	98.2	98.7	97.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.9	102.5	105.9	104.9	104.3	101.0	102.3	99.1	98.1
1988	112.4	102.3	106.2	111.6	109.8	105.8	109.1	105.1	99.3
1989	110.6	103.6	106.8	118.0	106.8	103.6	114.0	110.5	106.7
1990	109.1	103.7	106.1	121.0	105.3	102.8	116.7	114.0	110.8
1991	106.6	102.6	103.8	125.0	103.9	102.7	121.8	120.4	117.2
1992	108.2	101.4	103.7	127.9	106.7	104.3	126.1	123.2	118.2

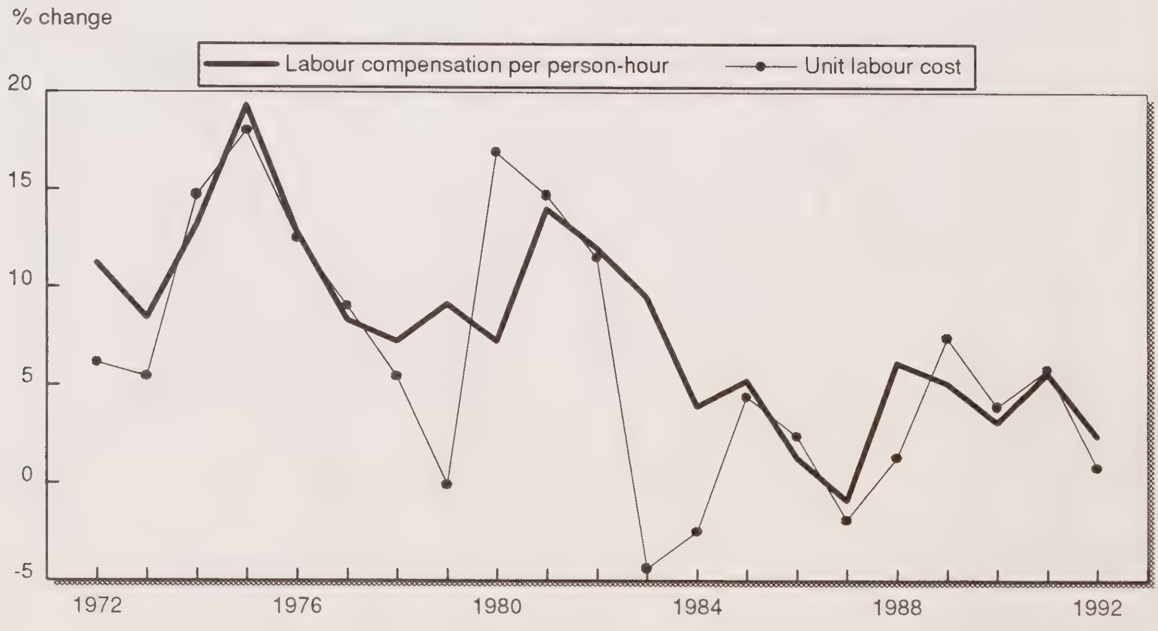


Table 9

Indices of labour productivity and unit labour cost, communication industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	35.8	75.4	76.8	19.1	47.5	46.6	25.3	24.9	53.3
1973	39.8	80.5	82.2	22.5	49.4	48.4	28.0	27.4	56.6
1974	44.9	86.4	88.0	26.8	51.9	51.0	31.0	30.5	59.8
1975	50.6	86.6	86.7	31.5	58.4	58.4	36.4	36.4	62.3
1976	55.7	93.2	93.1	38.2	59.8	59.8	41.0	41.0	68.6
1977	59.1	96.3	95.3	44.6	61.4	62.0	46.4	46.8	75.5
1978	64.8	95.0	95.5	49.1	68.3	67.9	51.7	51.4	75.7
1979	71.2	96.7	96.6	55.5	73.6	73.7	57.4	57.5	78.0
1980	77.9	99.3	99.8	62.4	78.4	78.1	62.9	62.6	80.2
1981	84.0	102.0	101.0	73.4	82.3	83.2	72.0	72.7	87.4
1982	83.9	103.8	101.7	81.5	80.9	82.5	78.5	80.1	97.1
1983	86.1	102.3	99.0	86.3	84.1	86.9	84.3	87.2	100.3
1984	90.2	101.4	100.2	93.6	88.9	90.0	92.2	93.3	103.7
1985	95.4	101.3	100.7	98.4	94.1	94.8	97.1	97.8	103.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.7	102.7	102.1	106.2	103.9	104.5	103.4	104.0	99.5
1988	114.9	103.7	103.2	110.1	110.8	111.4	106.2	106.7	95.8
1989	127.1	104.7	103.9	119.0	121.4	122.3	113.7	114.5	93.6
1990	134.7	104.0	103.5	126.4	129.5	130.2	121.5	122.1	93.8
1991	140.3	102.9	102.4	134.5	136.4	137.0	130.8	131.3	95.9
1992	143.3	104.0	104.0	142.4	137.8	137.9	136.9	136.9	99.3

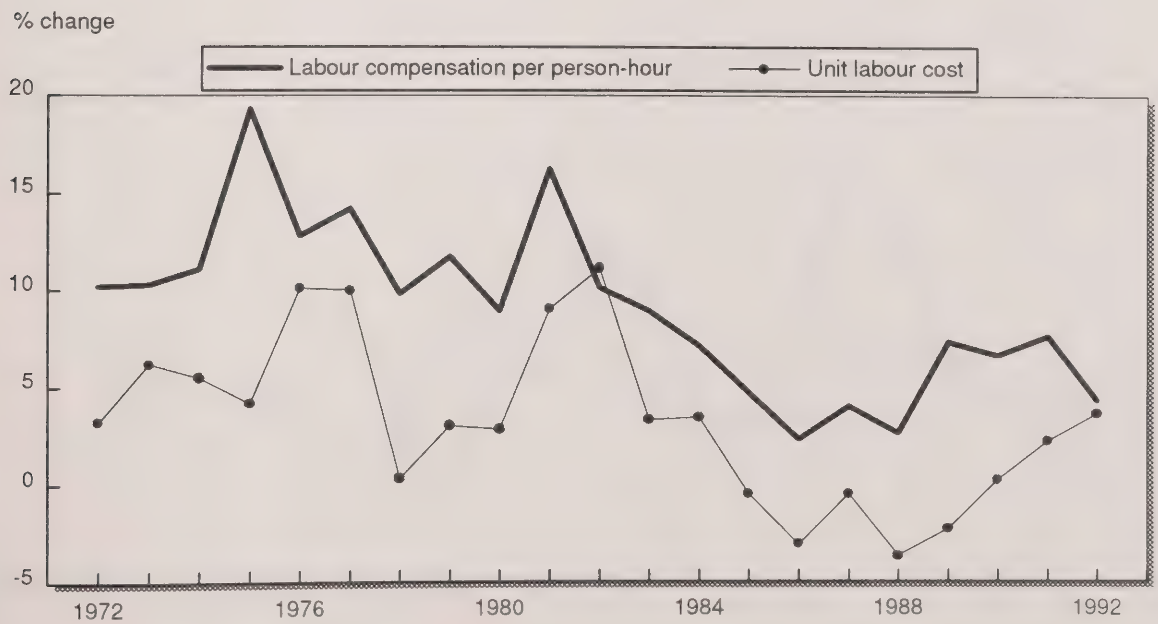


Table 10

Indices of labour productivity and unit labour cost, wholesale trade industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	52.7	65.3	67.0	20.6	80.7	78.7	31.6	30.8	39.2
1973	56.4	68.6	72.0	24.1	82.2	78.4	35.1	33.4	42.7
1974	58.5	72.1	73.7	29.1	81.1	79.4	40.3	39.4	49.7
1975	60.2	74.0	74.7	35.4	81.4	80.6	47.9	47.4	58.9
1976	63.8	74.9	75.8	40.2	85.1	84.2	53.6	53.0	63.0
1977	62.2	77.6	77.2	43.0	80.2	80.6	55.4	55.7	69.1
1978	63.5	81.4	82.1	47.5	78.0	77.4	58.3	57.8	74.8
1979	67.3	82.7	82.4	54.0	81.3	81.6	65.2	65.5	80.2
1980	72.1	81.3	81.3	61.1	88.7	88.7	75.2	75.2	84.8
1981	77.0	87.1	86.7	69.8	88.5	88.8	80.2	80.5	90.7
1982	70.6	83.2	82.1	71.4	84.9	86.0	85.8	87.0	101.1
1983	77.0	89.2	87.1	76.1	86.3	88.4	85.4	87.5	98.9
1984	83.0	94.8	92.7	84.8	87.6	89.6	89.5	91.5	102.2
1985	93.4	100.2	98.4	92.9	93.1	94.9	92.6	94.4	99.5
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	107.8	106.0	105.9	113.7	101.7	101.8	107.3	107.4	105.4
1988	115.7	109.7	109.7	125.5	105.4	105.5	114.3	114.4	108.4
1989	120.6	113.1	111.7	137.4	106.6	107.9	121.5	123.0	113.9
1990	120.5	118.1	118.4	150.0	102.0	101.8	126.9	126.7	124.5
1991	120.9	115.7	115.5	151.9	104.5	104.7	131.3	131.5	125.7
1992	129.8	116.7	116.3	159.5	111.2	111.6	136.6	137.1	122.9

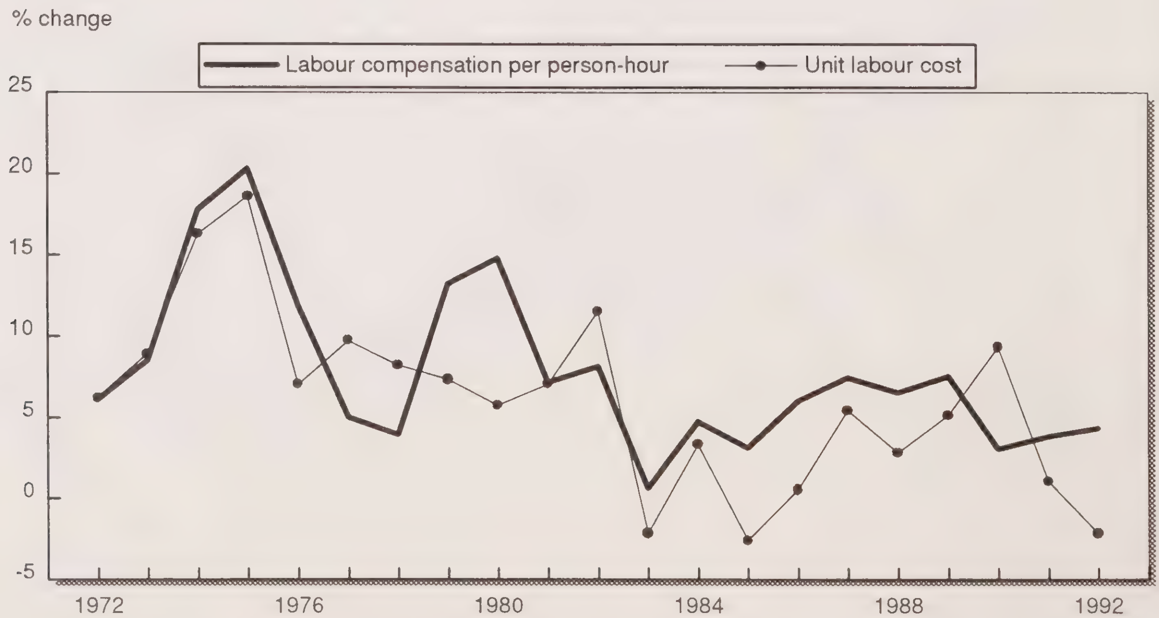


Table 11

Indices of labour productivity and unit labour cost, retail trade industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	69.5	68.5	74.7	24.1	101.4	93.0	35.2	32.2	34.7
1973	72.9	72.5	78.3	26.8	100.6	93.1	36.9	34.2	36.7
1974	74.7	76.9	82.7	31.8	97.2	90.4	41.3	38.4	42.5
1975	78.4	79.3	84.7	37.6	98.9	92.7	47.4	44.4	47.9
1976	83.1	80.2	84.2	42.8	103.6	98.7	53.3	50.8	51.5
1977	83.5	81.2	84.5	47.4	102.9	98.9	58.4	56.1	56.7
1978	85.1	85.1	87.9	49.9	100.0	96.9	58.6	56.8	58.6
1979	85.8	88.3	91.0	56.4	97.1	94.3	63.9	62.0	65.8
1980	84.9	91.3	93.5	62.6	93.0	90.8	68.6	67.0	73.7
1981	85.5	95.2	96.8	70.3	89.7	88.2	73.8	72.6	82.3
1982	82.5	92.7	92.1	76.0	89.0	89.5	82.0	82.5	92.2
1983	86.8	89.1	87.1	78.2	97.5	99.6	87.8	89.8	90.1
1984	91.9	93.8	93.0	86.1	98.0	98.8	91.7	92.5	93.6
1985	96.8	97.3	96.7	93.3	99.6	100.1	96.0	96.5	96.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.9	100.9	100.4	107.1	104.9	105.4	106.2	106.7	101.2
1988	109.1	103.6	102.8	117.6	105.4	106.2	113.5	114.4	107.7
1989	111.8	105.4	104.1	127.6	106.1	107.5	121.1	122.6	114.1
1990	108.4	105.4	104.9	132.3	102.8	103.3	125.6	126.2	122.1
1991	103.9	104.2	101.6	135.1	99.7	102.2	129.6	132.9	130.0
1992	105.8	103.7	102.1	135.2	102.1	103.7	130.5	132.5	127.8

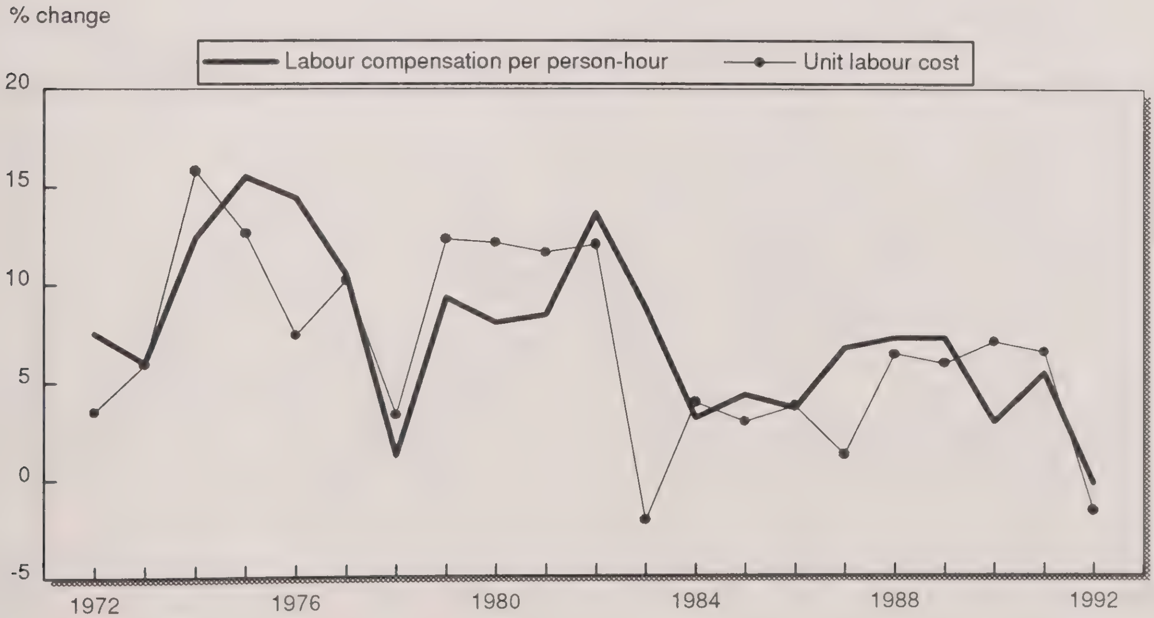


Table 12

Indices of labour productivity and unit labour cost, community, business, personal services industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1972	47.4	45.3	49.0	17.4	104.7	96.6	38.4	35.5	36.7
1973	52.7	49.0	53.3	20.4	107.7	98.9	41.7	38.3	38.8
1974	57.2	53.0	57.1	24.4	108.0	100.2	46.0	42.7	42.6
1975	59.9	56.1	60.5	27.6	106.8	99.0	49.1	45.5	46.0
1976	64.6	58.6	62.8	33.0	110.1	102.8	56.3	52.6	51.1
1977	66.3	62.4	65.0	36.3	106.2	102.0	58.1	55.8	54.7
1978	70.9	65.9	69.7	40.4	107.6	101.7	61.3	57.9	56.9
1979	73.6	70.7	73.9	45.6	104.0	99.5	64.5	61.7	62.0
1980	81.0	75.4	78.0	54.2	107.3	103.8	71.8	69.5	66.9
1981	87.6	80.2	82.5	62.8	109.2	106.2	78.2	76.1	71.7
1982	86.3	82.9	83.5	70.1	104.1	103.4	84.5	83.9	81.1
1983	85.1	86.6	86.4	74.3	98.3	98.5	85.7	85.9	87.2
1984	90.1	88.6	88.7	82.1	101.7	101.6	92.7	92.6	91.1
1985	93.6	97.0	97.4	91.7	96.5	96.1	94.5	94.2	98.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.7	105.2	106.3	113.0	100.5	99.4	107.4	106.3	106.9
1988	113.7	111.1	113.1	127.4	102.3	100.5	114.7	112.6	112.1
1989	119.2	115.7	116.5	142.6	103.1	102.3	123.3	122.4	119.6
1990	119.9	119.6	120.7	153.5	100.2	99.3	128.3	127.2	128.1
1991	115.4	118.5	117.9	159.2	97.4	97.9	134.3	135.1	137.9
1992	114.8	119.5	117.1	165.1	96.1	98.0	138.2	141.0	143.9

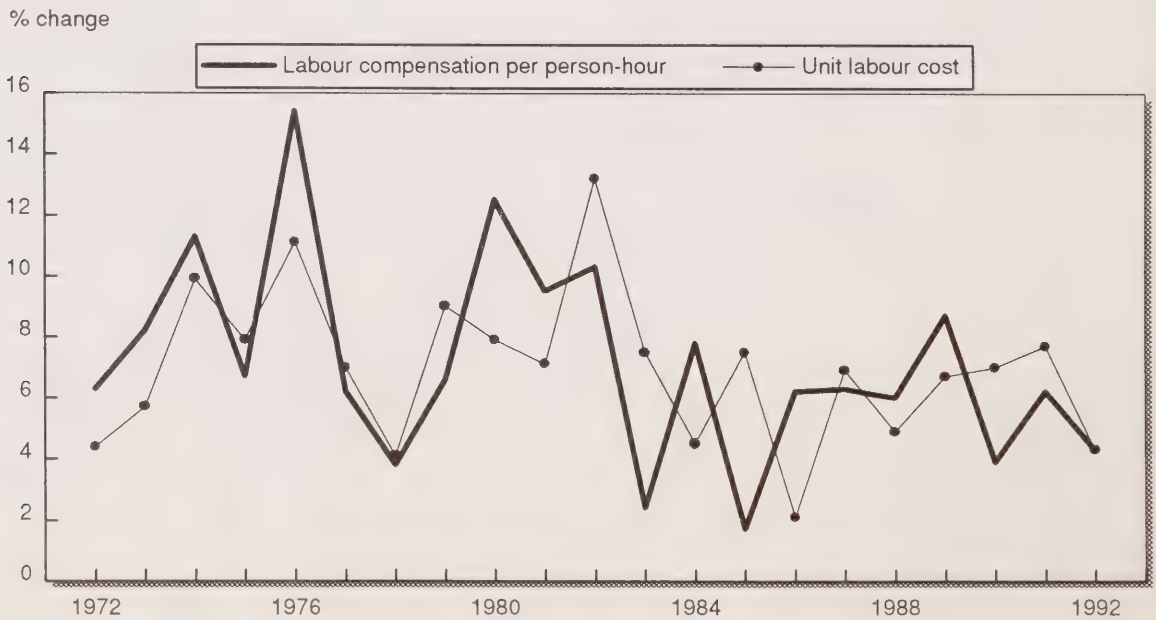


Table 13

Indices of labour productivity and unit labour cost, food industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	79.3	97.6	101.5	27.1	81.2	78.1	27.8	26.7	34.2
1973	83.0	98.4	101.8	29.5	84.3	81.5	30.0	29.0	35.6
1974	82.2	96.9	100.2	33.8	84.8	82.0	34.8	33.7	41.1
1975	76.3	96.6	100.2	39.4	79.0	76.2	40.8	39.4	51.6
1976	84.6	96.4	99.9	44.9	87.8	84.7	46.6	45.0	53.1
1977	89.3	98.0	100.6	49.6	91.2	88.8	50.7	49.3	55.6
1978	90.6	100.1	102.6	54.4	90.5	88.3	54.3	53.0	60.0
1979	93.7	101.1	103.4	60.5	92.7	90.7	59.8	58.5	64.5
1980	91.3	102.4	103.5	67.2	89.1	88.1	65.6	64.9	73.6
1981	92.0	101.1	101.1	75.9	90.9	91.0	75.0	75.1	82.5
1982	91.9	98.2	97.5	80.7	93.6	94.3	82.2	82.8	87.8
1983	90.3	95.9	97.4	84.9	94.2	92.7	88.5	87.2	94.0
1984	94.4	96.0	97.9	88.4	98.3	96.4	92.1	90.4	93.7
1985	100.6	98.6	99.0	93.8	102.1	101.6	95.2	94.7	93.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.7	101.1	102.2	106.1	99.6	98.6	104.9	103.9	105.3
1988	100.3	102.7	104.6	113.4	97.7	95.8	110.4	108.4	113.1
1989	97.1	103.6	104.5	116.4	93.7	92.9	112.3	111.3	119.9
1990	98.2	101.5	103.7	120.1	96.7	94.6	118.4	115.8	122.4

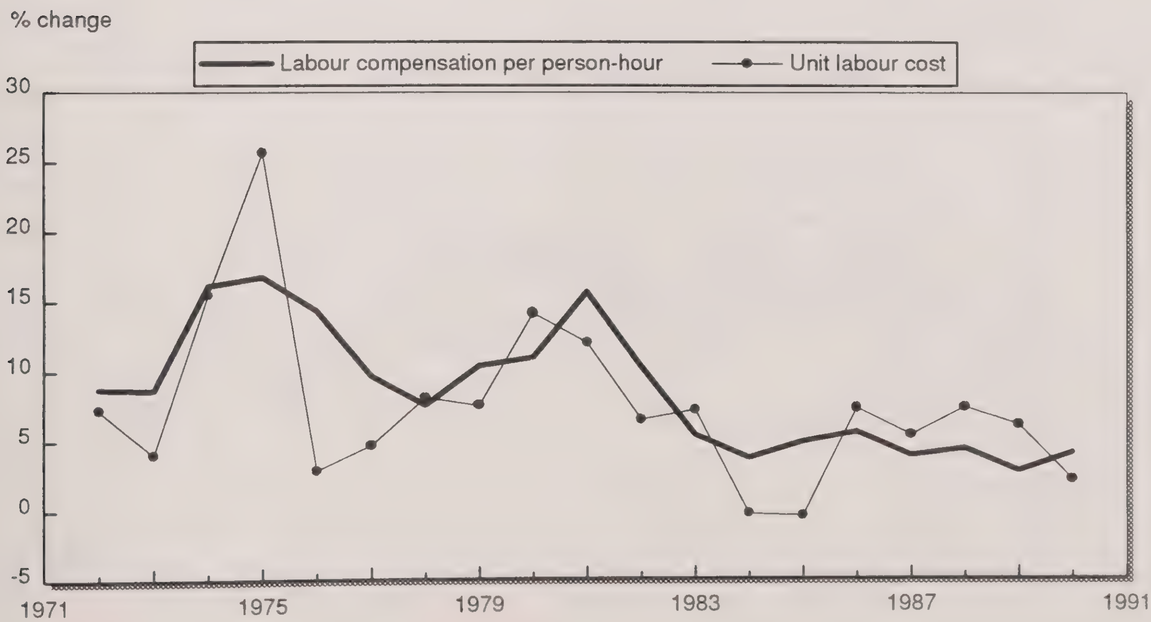


Table 14

Indices of labour productivity and unit labour cost, beverage industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	109.5	97.1	101.3	25.3	112.8	108.2	26.1	25.0	23.1
1973	119.6	99.1	102.8	28.1	120.7	116.4	28.4	27.4	23.5
1974	121.0	102.7	106.5	33.1	117.9	113.7	32.2	31.0	27.3
1975	116.3	103.0	107.2	38.4	112.9	108.5	37.3	35.9	33.1
1976	112.7	103.3	107.3	44.2	109.1	105.0	42.8	41.2	39.3
1977	118.3	104.4	107.5	48.9	113.3	110.1	46.9	45.5	41.4
1978	115.7	103.2	106.0	52.0	112.2	109.2	50.4	49.1	45.0
1979	118.3	105.0	107.6	58.4	112.7	109.9	55.6	54.2	49.3
1980	114.0	102.0	103.4	64.0	111.7	110.2	62.8	61.9	56.2
1981	113.4	103.1	103.3	72.0	110.0	109.8	69.8	69.7	63.5
1982	103.3	100.6	100.1	78.5	102.7	103.2	78.0	78.4	76.0
1983	99.3	98.7	98.9	84.2	100.6	100.4	85.3	85.1	84.8
1984	103.8	99.9	97.5	89.7	103.9	106.5	89.8	92.0	86.4
1985	105.4	100.6	100.9	94.8	104.9	104.5	94.2	93.9	89.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.7	98.8	100.1	103.7	102.9	101.5	104.9	103.6	102.0
1988	105.1	99.2	102.1	106.8	105.9	102.9	107.6	104.6	101.6
1989	106.3	87.4	86.5	98.4	121.6	122.9	112.6	113.8	92.6
1990	103.0	75.2	75.2	91.1	136.9	136.8	121.2	121.1	88.5

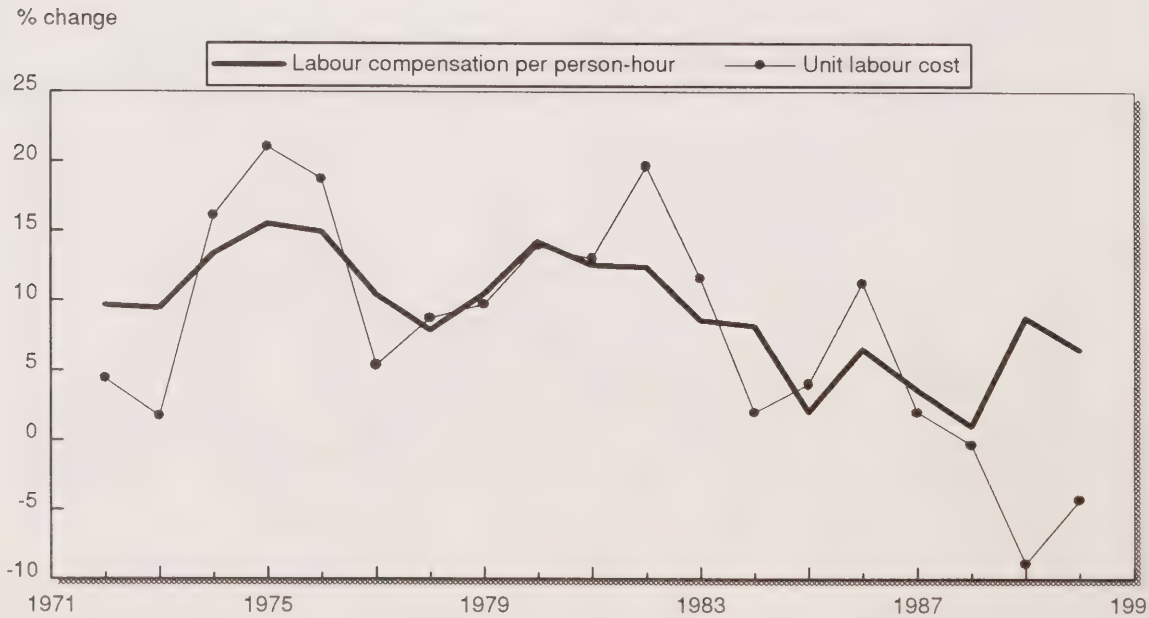


Table 15

Indices of labour productivity and unit labour cost, tobacco products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	138.8	135.5	151.3	30.4	102.5	91.7	22.5	20.1	21.9
1973	142.1	133.7	146.7	32.6	106.3	96.9	24.4	22.2	22.9
1974	152.9	136.5	147.6	36.4	112.0	103.6	26.7	24.7	23.8
1975	154.4	138.2	151.0	43.9	111.7	102.2	31.8	29.1	28.5
1976	146.8	129.7	142.1	47.2	113.2	103.3	36.4	33.2	32.1
1977	168.4	127.4	136.0	52.2	132.2	123.9	41.0	38.4	31.0
1978	142.6	124.8	133.7	53.8	114.3	106.7	43.2	40.3	37.8
1979	147.5	123.7	133.0	58.3	119.2	110.9	47.2	43.9	39.6
1980	149.6	120.8	127.2	63.9	123.8	117.6	52.9	50.3	42.7
1981	153.4	124.2	132.5	77.4	123.5	115.7	62.3	58.4	50.4
1982	149.6	123.7	128.7	84.0	121.0	116.2	67.9	65.3	56.1
1983	135.2	115.0	120.0	89.2	117.6	112.6	77.6	74.3	66.0
1984	128.3	109.1	113.3	91.9	117.6	113.2	84.2	81.1	71.6
1985	105.9	101.5	107.6	96.2	104.3	98.4	94.7	89.4	90.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.5	85.1	87.5	94.8	125.1	121.6	111.4	108.3	89.1
1988	108.6	78.7	81.3	89.6	138.0	133.5	113.9	110.2	82.5
1989	99.9	73.7	75.2	90.8	135.5	132.8	123.2	120.7	90.9
1990	96.4	70.5	72.9	93.1	136.7	132.1	132.0	127.6	96.6

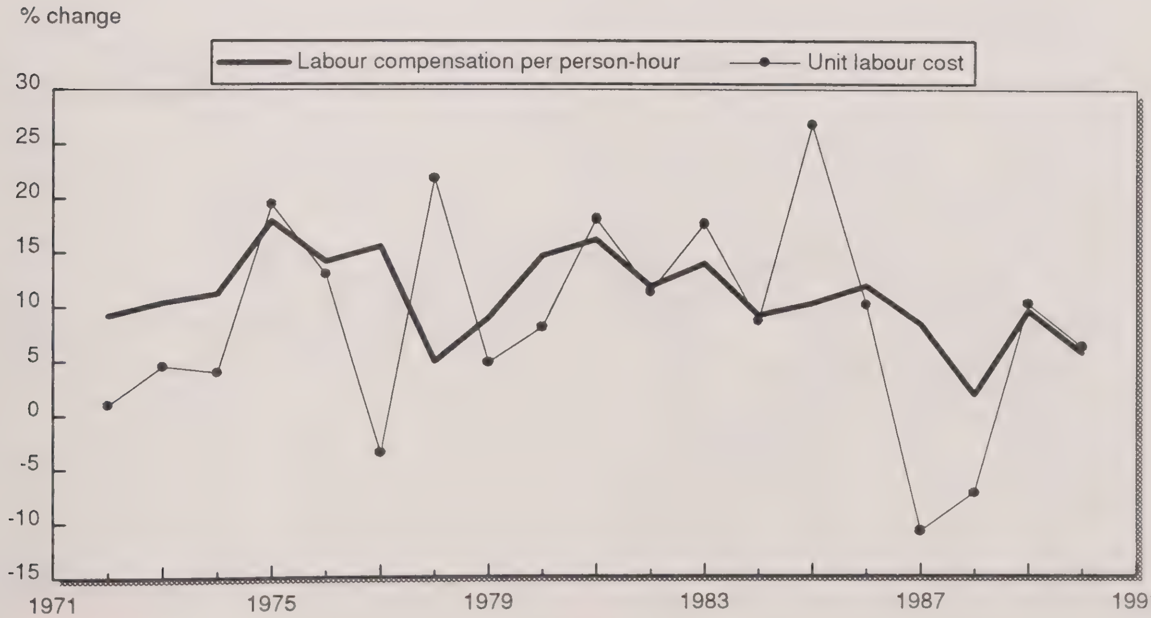


Table 16

Indices of labour productivity and unit labour cost, rubber products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1972	64.2	87.6	91.1	25.0	73.4	70.6	28.6	27.5	38.9
1973	74.5	97.0	100.0	29.2	76.8	74.5	30.1	29.2	39.2
1974	66.9	95.2	96.1	31.2	70.3	69.6	32.8	32.4	46.6
1975	64.0	96.4	97.0	35.9	66.4	66.0	37.3	37.1	56.2
1976	79.3	100.8	102.1	41.9	78.6	77.6	41.6	41.0	52.8
1977	90.9	101.1	102.0	45.9	89.8	89.1	45.4	45.0	50.5
1978	94.6	102.9	104.0	49.9	92.0	91.0	48.6	48.0	52.8
1979	107.6	105.7	109.6	60.1	101.8	98.2	56.9	54.9	55.9
1980	92.7	102.2	103.1	63.4	90.7	90.0	62.0	61.5	68.3
1981	88.0	103.3	105.1	73.5	85.2	83.7	71.2	70.0	83.6
1982	76.7	97.3	98.5	76.4	78.8	77.9	78.5	77.6	99.6
1983	89.6	97.6	99.0	81.4	91.8	90.5	83.4	82.3	90.9
1984	112.9	99.3	100.5	90.6	113.7	112.3	91.2	90.1	80.3
1985	114.5	98.4	99.9	93.4	116.3	114.6	94.8	93.4	81.5
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.7	94.1	94.6	97.0	111.3	110.8	103.1	102.6	92.6
1988	110.0	101.6	103.4	109.1	108.2	106.3	107.4	105.6	99.3
1989	106.4	99.4	100.7	109.3	107.1	105.6	110.0	108.5	102.7
1990	104.2	96.3	96.5	113.2	108.2	107.9	117.5	117.2	108.6

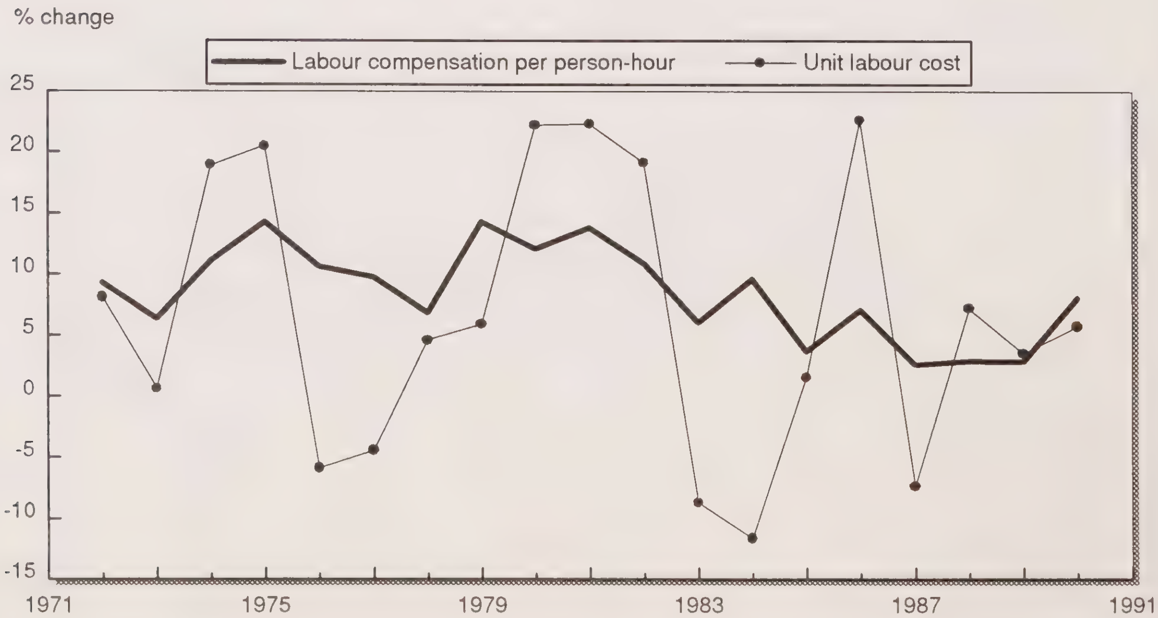


Table 17

Indices of labour productivity and unit labour cost, plastic products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	46.9	57.5	59.1	17.1	81.4	79.3	29.7	28.9	36.5
1973	54.4	63.9	65.1	20.3	85.1	83.5	31.7	31.2	37.3
1974	52.7	66.7	66.6	24.3	79.0	79.1	36.4	36.5	46.1
1975	47.9	65.5	65.1	26.7	73.1	73.6	40.8	41.0	55.7
1976	53.5	68.7	68.8	32.1	77.9	77.8	46.7	46.6	59.9
1977	56.2	69.6	69.3	35.7	80.7	81.0	51.3	51.5	63.6
1978	63.7	76.1	76.0	42.0	83.7	83.8	55.2	55.2	65.9
1979	73.7	80.0	82.0	48.1	92.1	90.0	60.2	58.7	65.3
1980	73.5	82.4	82.1	54.6	89.2	89.5	66.2	66.5	74.3
1981	75.5	81.6	82.0	61.6	92.5	92.0	75.5	75.1	81.6
1982	68.8	76.4	76.4	62.6	90.1	90.1	82.0	82.0	91.0
1983	78.7	76.3	77.2	67.4	103.1	101.9	88.3	87.3	85.6
1984	90.1	85.4	85.6	77.9	105.5	105.3	91.2	91.1	86.5
1985	99.6	92.3	93.4	89.1	107.9	106.7	96.5	95.4	89.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	112.3	108.0	108.8	111.8	104.0	103.2	103.5	102.7	99.5
1988	115.1	122.2	123.5	133.3	94.2	93.2	109.1	107.9	115.8
1989	118.7	127.6	130.6	142.7	93.1	90.9	111.8	109.2	120.2
1990	114.8	125.4	126.6	149.8	91.5	90.7	119.5	118.3	130.4

Table 18

Indices of labour productivity and unit labour cost, leather & allied products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	82.5	124.7	131.8	38.2	66.1	62.6	30.6	29.0	46.3
1973	83.8	124.0	129.2	41.0	67.6	64.8	33.1	31.7	48.9
1974	86.8	121.0	128.2	46.6	71.7	67.7	38.5	36.4	53.7
1975	87.2	121.7	125.2	52.6	71.7	69.7	43.2	42.0	60.3
1976	95.9	120.4	124.9	59.7	79.6	76.8	49.6	47.8	62.3
1977	88.9	107.7	112.0	58.6	82.5	79.3	54.4	52.3	65.9
1978	101.7	110.9	114.5	66.0	91.7	88.8	59.5	57.6	64.9
1979	103.1	115.8	120.4	75.6	89.0	85.6	65.3	62.8	73.4
1980	98.5	113.2	115.9	78.6	87.0	84.9	69.4	67.8	79.8
1981	103.5	117.3	120.1	91.5	88.2	86.2	78.0	76.2	88.4
1982	90.2	101.2	104.6	85.2	89.1	86.2	84.2	81.5	94.5
1983	95.2	101.9	102.5	89.3	93.5	92.9	87.7	87.2	93.8
1984	104.3	104.1	105.6	96.7	100.2	98.7	92.9	91.5	92.7
1985	100.1	98.6	99.9	97.0	101.6	100.2	98.5	97.1	97.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	92.6	92.9	91.1	96.1	99.7	101.6	103.4	105.5	103.8
1988	86.2	86.3	85.5	92.0	99.9	100.9	106.6	107.7	106.7
1989	83.5	79.1	81.8	86.3	105.6	102.0	109.2	105.5	103.4
1990	72.8	70.9	72.5	85.3	102.6	100.4	120.2	117.6	117.2

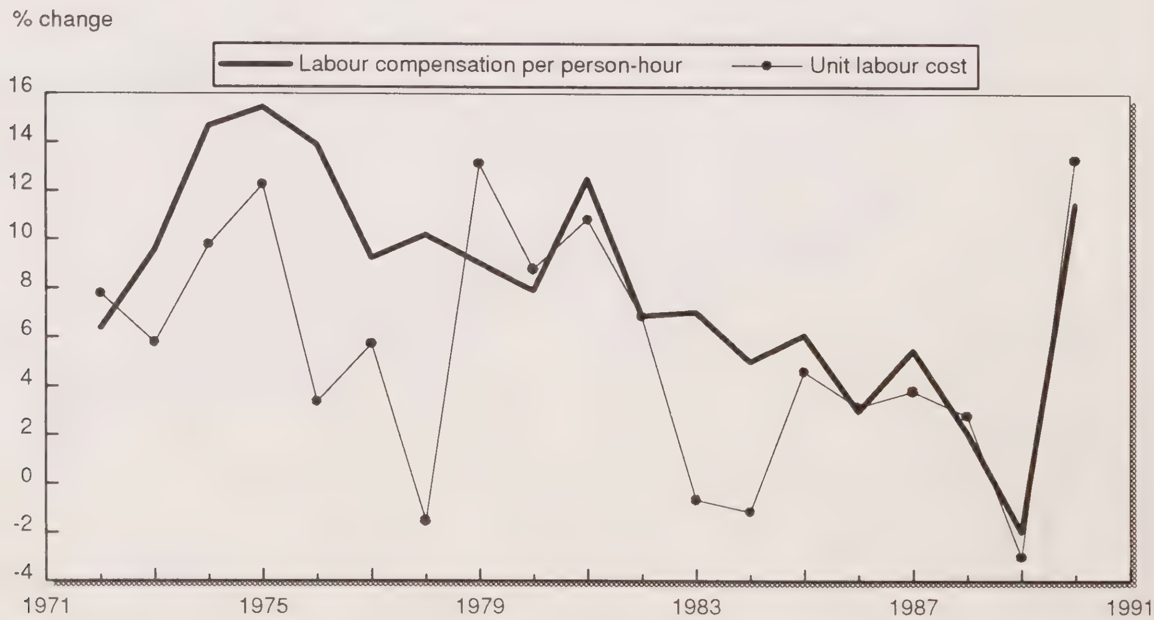


Table 19

Indices of labour productivity and unit labour cost, primary textile & textile products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	67.0	123.8	129.4	34.9	54.1	51.8	28.2	27.0	52.1
1973	71.4	128.8	133.7	38.7	55.5	53.4	30.1	29.0	54.2
1974	72.1	128.7	132.4	43.9	56.0	54.4	34.1	33.1	60.9
1975	70.8	121.0	123.9	46.3	58.5	57.2	38.2	37.3	65.3
1976	72.0	113.3	115.3	50.4	63.5	62.4	44.5	43.7	70.0
1977	75.8	106.2	107.2	52.6	71.4	70.8	49.5	49.0	69.3
1978	83.4	108.1	109.3	58.3	77.2	76.3	53.9	53.3	69.9
1979	90.6	112.1	113.2	67.0	80.8	80.0	59.8	59.2	74.0
1980	88.1	111.3	111.1	73.5	79.1	79.3	66.0	66.1	83.4
1981	91.8	109.6	110.3	80.9	83.8	83.2	73.8	73.3	88.1
1982	71.2	96.4	97.7	75.7	73.9	72.9	78.5	77.5	106.3
1983	91.6	102.7	103.1	86.8	89.2	88.9	84.5	84.2	94.7
1984	91.1	101.5	101.1	90.3	89.7	90.1	89.0	89.3	99.2
1985	90.4	97.8	96.2	93.9	92.5	94.0	96.1	97.7	103.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.9	102.6	103.0	108.2	100.3	99.9	105.5	105.0	105.2
1988	101.2	104.5	105.4	113.7	96.8	96.0	108.8	107.8	112.3
1989	98.3	100.7	102.9	113.0	97.6	95.5	112.3	109.8	115.0
1990	90.4	94.6	95.0	111.3	95.5	95.1	117.7	117.2	123.2

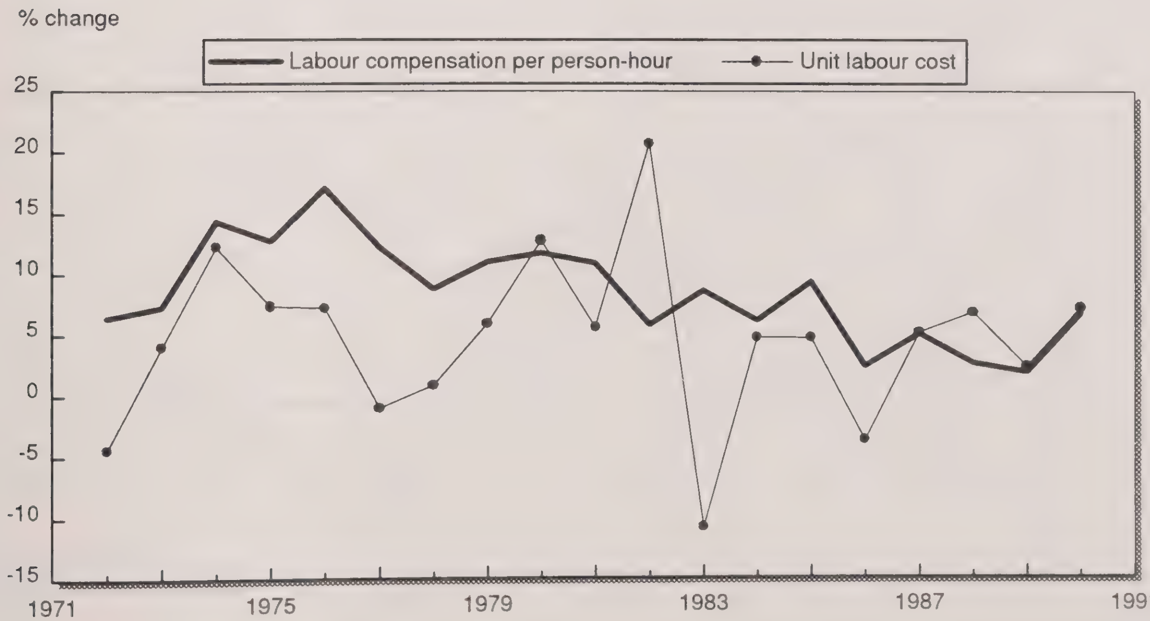


Table 20

Indices of labour productivity and unit labour cost, clothing industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compen-sation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compen-sation per person	Compen-sation per person-hour	Unit labour cost
1972	73.0	109.4	111.6	34.7	66.8	65.5	31.7	31.1	47.5
1973	78.3	111.7	112.0	38.1	70.1	69.8	34.1	34.0	48.6
1974	78.9	109.0	109.9	42.9	72.4	71.8	39.4	39.0	54.3
1975	81.8	107.9	109.1	49.4	75.8	74.9	45.7	45.2	60.4
1976	87.2	109.4	110.2	56.7	79.7	79.1	51.9	51.5	65.1
1977	85.7	101.9	102.0	58.4	84.2	84.1	57.3	57.2	68.1
1978	92.9	102.6	102.5	64.1	90.6	90.6	62.5	62.5	68.9
1979	99.7	103.8	103.9	71.7	96.1	96.0	69.1	69.0	71.9
1980	94.1	99.9	98.3	75.7	94.1	95.7	75.8	77.1	80.5
1981	96.9	99.7	96.9	82.2	97.3	100.0	82.5	84.8	84.8
1982	86.1	94.0	89.9	80.3	91.6	95.7	85.5	89.3	93.3
1983	86.2	96.6	95.8	85.3	89.2	90.0	88.3	89.1	99.0
1984	92.8	97.3	97.3	90.1	95.4	95.4	92.6	92.6	97.1
1985	95.8	97.5	96.9	93.3	98.2	98.9	95.7	96.3	97.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.6	98.5	102.2	105.9	105.2	101.4	107.5	103.6	102.2
1988	101.4	101.6	103.2	112.8	99.8	98.3	111.0	109.2	111.2
1989	100.2	98.7	99.6	115.0	101.5	100.6	116.6	115.6	114.8
1990	95.9	91.0	92.7	111.8	105.4	103.5	122.9	120.6	116.6

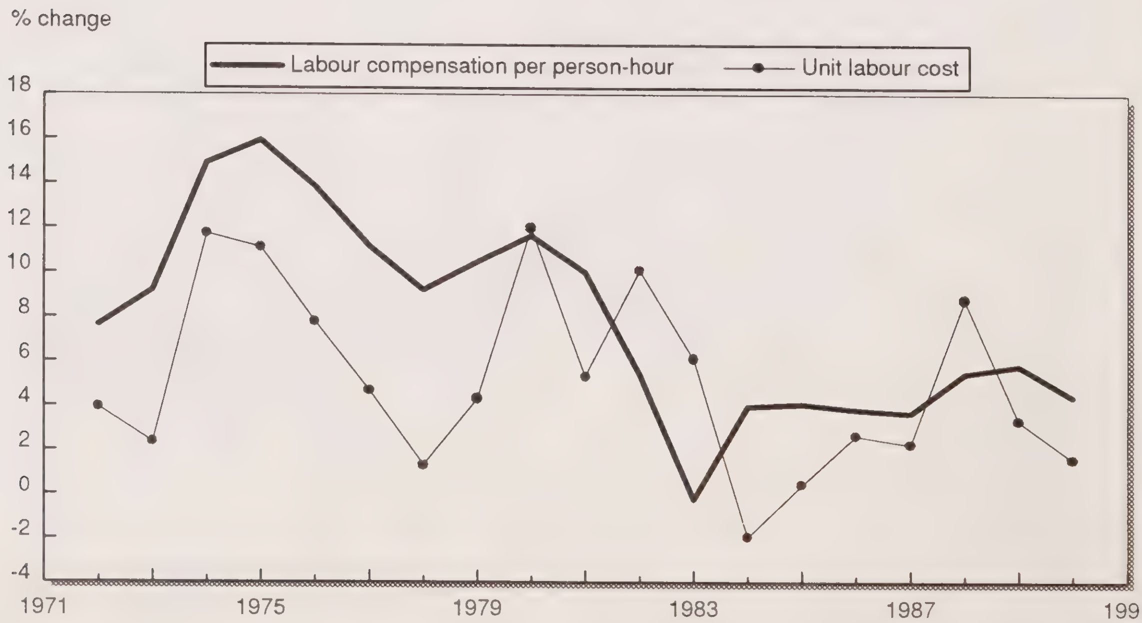


Table 21

Indices of labour productivity and unit labour cost, wood industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	55.6	93.5	96.8	25.9	59.5	57.5	27.7	26.8	46.6
1973	61.3	101.5	105.0	31.3	60.3	58.4	30.8	29.8	51.1
1974	63.5	97.2	99.4	35.0	65.3	63.9	36.0	35.3	55.1
1975	56.4	89.3	90.9	36.6	63.2	62.1	41.0	40.3	64.9
1976	68.4	97.6	100.1	46.8	70.1	68.4	47.9	46.7	68.3
1977	75.9	100.0	101.8	54.1	75.9	74.6	54.1	53.1	71.2
1978	76.2	107.3	108.5	62.3	71.0	70.2	58.1	57.4	81.7
1979	76.4	110.2	111.5	70.9	69.4	68.5	64.4	63.6	92.8
1980	81.5	106.0	106.4	75.7	76.8	76.6	71.4	71.1	92.9
1981	78.3	101.7	97.0	79.4	77.0	80.7	78.1	81.9	101.4
1982	63.3	87.8	80.2	72.4	72.1	79.0	82.5	90.3	114.4
1983	78.3	92.0	89.0	83.6	85.0	88.0	90.9	94.0	106.9
1984	87.8	92.9	91.8	88.0	94.5	95.6	94.7	95.8	100.2
1985	99.7	97.0	96.8	95.3	102.8	103.0	98.3	98.5	95.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	115.5	109.4	110.0	116.3	105.6	105.0	106.4	105.8	100.8
1988	117.7	111.5	114.2	123.3	105.5	103.1	110.6	108.0	104.8
1989	115.4	111.6	112.7	125.9	103.4	102.4	112.8	111.7	109.1
1990	107.2	104.1	104.4	123.6	103.0	102.7	118.7	118.4	115.2

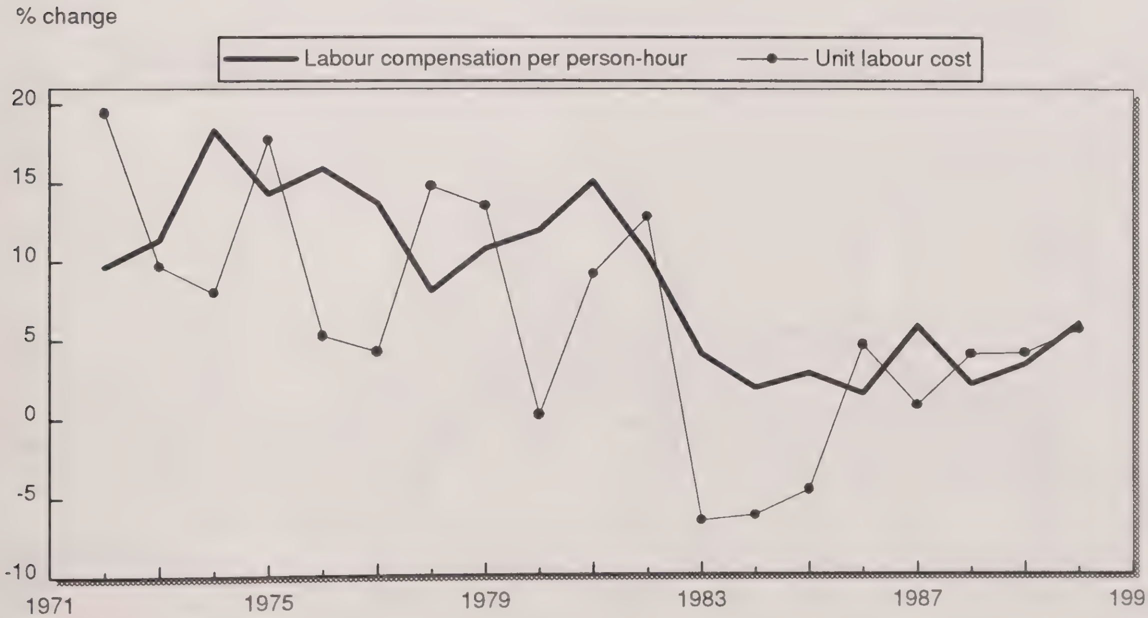


Table 22

Indices of labour productivity and unit labour cost, furniture & fixture industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	88.2	81.1	84.3	25.2	108.7	104.6	31.0	29.8	28.5
1973	97.3	84.3	87.4	28.3	115.4	111.3	33.6	32.4	29.1
1974	85.2	88.6	92.2	33.8	96.1	92.4	38.2	36.7	39.7
1975	80.6	86.5	89.4	37.1	93.2	90.2	42.9	41.4	46.0
1976	88.2	83.7	87.2	41.7	105.4	101.2	49.8	47.9	47.3
1977	81.9	76.5	79.3	41.6	107.1	103.3	54.4	52.4	50.7
1978	89.7	78.7	81.1	45.8	114.0	110.6	58.2	56.5	51.1
1979	88.5	85.9	89.5	53.0	103.0	98.9	61.7	59.2	59.9
1980	82.3	85.6	87.7	58.4	96.2	93.9	68.2	66.6	70.9
1981	91.7	88.5	90.2	69.8	103.6	101.6	78.8	77.3	76.1
1982	69.9	79.8	80.8	64.9	87.6	86.5	81.4	80.4	92.9
1983	79.0	78.8	77.7	69.4	100.3	101.6	88.2	89.3	87.9
1984	85.0	81.6	81.4	76.0	104.2	104.5	93.1	93.4	89.4
1985	94.7	89.9	89.5	87.1	105.4	105.9	97.0	97.4	92.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.8	110.9	111.4	111.8	90.0	89.5	100.9	100.4	112.1
1988	97.3	112.2	112.6	121.8	86.7	86.4	108.6	108.2	125.3
1989	96.2	114.1	109.9	127.2	84.3	87.6	111.5	115.8	132.3
1990	90.7	106.0	104.6	125.2	85.6	86.7	118.2	119.7	138.1

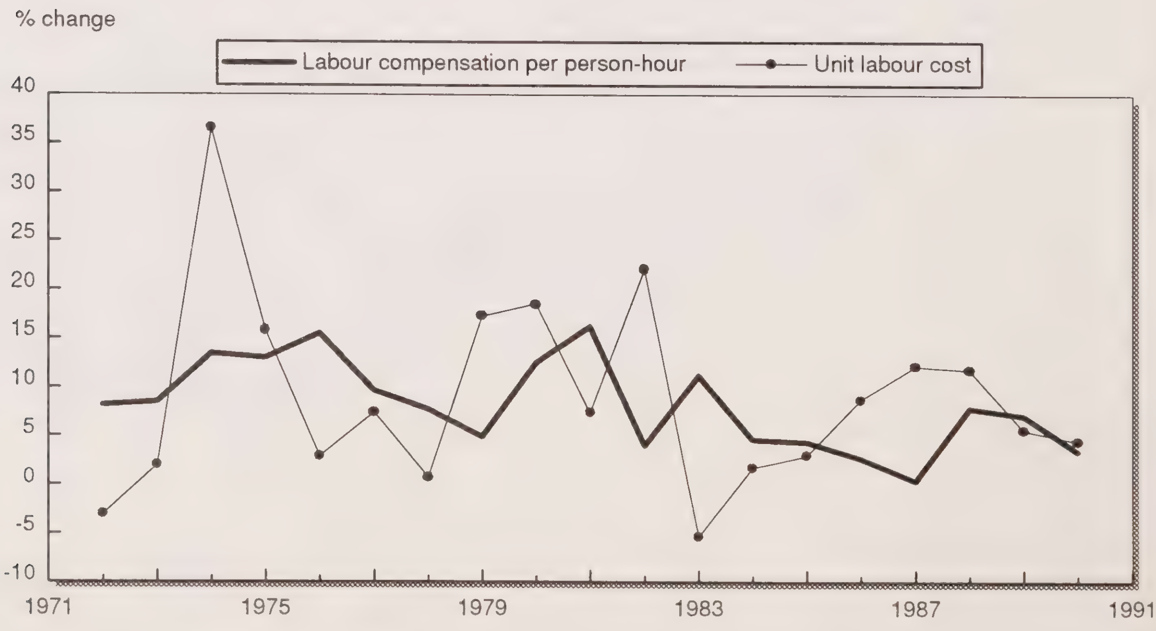


Table 23

Indices of labour productivity and unit labour cost, paper & allied products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compen-sation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compen-sation per person	Compen-sation per person-hour	Unit labour cost
1972	92.8	101.1	105.6	26.4	91.7	87.8	26.1	25.0	28.5
1973	100.3	103.1	106.7	28.8	97.2	94.0	27.9	27.0	28.7
1974	108.6	109.9	113.1	35.6	98.8	96.0	32.4	31.5	32.8
1975	77.3	106.5	99.6	36.6	72.5	77.6	34.3	36.7	47.4
1976	95.3	109.1	107.6	45.9	87.4	88.6	42.1	42.7	48.2
1977	94.2	104.0	106.0	49.3	90.6	88.8	47.5	46.5	52.4
1978	104.1	105.5	113.2	54.3	98.7	91.9	51.4	47.9	52.1
1979	102.8	106.9	108.1	59.3	96.2	95.1	55.4	54.8	57.6
1980	100.7	107.8	115.0	66.1	93.4	87.6	61.3	57.4	65.6
1981	96.7	107.6	108.1	75.4	89.9	89.5	70.1	69.8	78.0
1982	82.9	100.5	100.2	78.0	82.5	82.7	77.7	77.9	94.2
1983	92.8	97.6	97.7	82.1	95.0	94.9	84.1	84.0	88.5
1984	96.1	98.9	99.2	86.6	97.2	96.9	87.6	87.3	90.1
1985	94.9	97.5	97.9	92.8	97.3	96.9	95.1	94.8	97.7
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.0	102.0	101.7	105.4	104.0	104.3	103.4	103.7	99.4
1988	106.4	103.1	103.8	112.0	103.2	102.5	108.6	107.9	105.3
1989	102.4	101.8	104.2	114.7	100.6	98.3	112.6	110.1	112.0
1990	100.7	98.0	98.9	116.2	102.8	101.8	118.6	117.5	115.4

Table 24

Indices of labour productivity and unit labour cost, printing, publishing & allied industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	58.8	73.3	77.5	21.5	80.2	75.9	29.3	27.7	36.5
1973	65.0	77.4	80.9	24.2	84.0	80.4	31.3	30.0	37.3
1974	65.5	78.4	81.3	27.9	83.5	80.5	35.6	34.3	42.6
1975	66.4	78.7	81.2	31.6	84.3	81.7	40.1	38.9	47.6
1976	72.9	79.3	81.1	35.9	92.0	89.9	45.3	44.2	49.2
1977	76.5	78.1	79.3	38.7	97.9	96.4	49.5	48.7	50.6
1978	82.3	81.7	83.7	43.2	100.7	98.4	52.8	51.6	52.5
1979	84.1	85.4	86.6	48.7	98.4	97.1	57.0	56.2	57.9
1980	88.8	89.3	91.6	56.2	99.4	96.9	62.9	61.4	63.3
1981	91.0	89.7	90.2	64.2	101.3	100.8	71.6	71.2	70.6
1982	83.4	89.4	90.1	69.2	93.2	92.5	77.4	76.8	83.0
1983	86.3	89.3	89.1	75.5	96.6	96.8	84.5	84.7	87.5
1984	93.2	92.1	92.5	82.1	101.2	100.7	89.2	88.8	88.2
1985	97.6	95.0	95.0	90.3	102.7	102.8	95.0	95.1	92.5
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.8	103.4	103.7	107.2	96.5	96.2	103.6	103.3	107.4
1988	104.6	108.2	109.5	121.2	96.6	95.5	111.9	110.7	115.9
1989	107.4	114.1	114.8	132.0	94.2	93.5	115.8	115.0	123.0
1990	106.3	114.9	116.6	139.4	92.5	91.2	121.3	119.6	131.1

Table 25

Indices of labour productivity and unit labour cost, primary metal industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	91.4	110.0	115.4	27.8	83.1	79.2	25.3	24.1	30.4
1973	100.3	112.9	118.9	31.0	88.8	84.3	27.4	26.0	30.9
1974	107.6	118.4	124.9	36.9	90.9	86.1	31.1	29.5	34.3
1975	98.0	116.6	118.1	41.4	84.1	83.0	35.5	35.0	42.2
1976	90.2	113.7	115.0	45.4	79.3	78.4	39.9	39.5	50.3
1977	98.9	115.5	117.4	50.5	85.6	84.2	43.7	43.0	51.0
1978	104.1	118.3	120.6	55.9	88.0	86.3	47.3	46.4	53.7
1979	94.8	122.9	126.8	63.7	77.2	74.8	51.8	50.2	67.2
1980	87.3	124.5	128.4	72.2	70.1	67.9	58.0	56.2	82.7
1981	94.5	120.9	122.7	81.2	78.2	77.0	67.2	66.2	85.9
1982	71.0	109.8	110.0	84.1	64.7	64.5	76.6	76.4	118.4
1983	80.1	102.5	102.5	85.0	78.2	78.2	82.9	82.9	106.1
1984	98.0	105.3	109.4	95.6	93.1	89.5	90.8	87.3	97.5
1985	103.7	103.2	102.6	98.9	100.5	101.1	95.9	96.5	95.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	110.5	100.7	101.0	104.6	109.8	109.4	103.8	103.6	94.6
1988	116.4	105.1	107.4	114.3	110.7	108.4	108.7	106.5	98.2
1989	113.0	102.5	103.1	116.5	110.2	109.6	113.7	113.0	103.1
1990	107.0	93.1	96.0	111.7	114.9	111.4	119.9	116.3	104.4

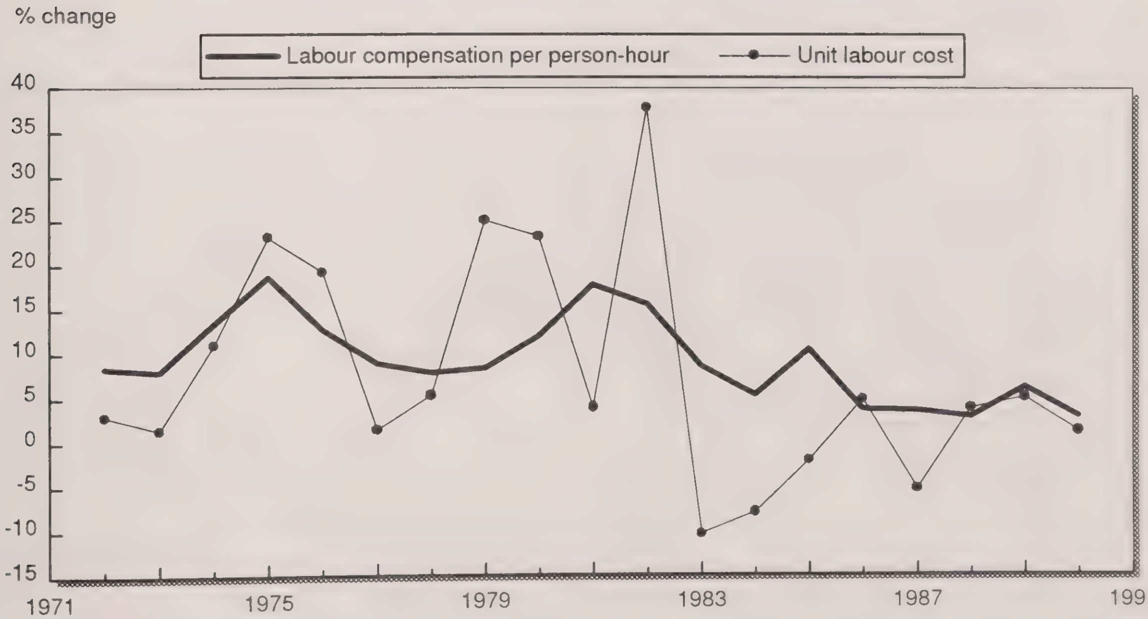


Table 26

Indices of labour productivity and unit labour cost, fabricated metal products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	85.1	95.2	98.7	30.4	89.5	86.3	32.0	30.8	35.7
1973	92.5	99.9	102.9	34.5	92.6	89.9	34.6	33.5	37.3
1974	100.4	106.1	107.8	41.7	94.6	93.1	39.3	38.7	41.5
1975	91.4	104.7	106.2	46.7	87.3	86.1	44.6	44.0	51.1
1976	97.6	106.1	107.5	53.1	92.0	90.8	50.0	49.4	54.4
1977	95.9	103.1	104.5	56.4	93.0	91.7	54.7	53.9	58.8
1978	99.0	105.8	108.0	61.9	93.6	91.7	58.5	57.3	62.5
1979	102.3	110.4	110.9	70.4	92.6	92.2	63.8	63.5	68.9
1980	102.4	109.0	109.6	76.7	93.9	93.5	70.3	70.0	74.9
1981	100.6	106.1	106.4	84.3	94.8	94.6	79.4	79.2	83.8
1982	85.5	94.2	93.1	82.2	90.8	91.8	87.2	88.2	96.1
1983	80.7	87.6	86.0	81.2	92.1	93.8	92.7	94.4	100.6
1984	86.9	87.4	86.8	83.9	99.4	100.0	96.0	96.7	96.6
1985	97.6	94.5	95.1	93.3	103.3	102.7	98.8	98.2	95.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.9	106.5	106.8	108.2	99.5	99.1	101.6	101.3	102.1
1988	108.3	114.0	115.0	122.7	95.0	94.1	107.6	106.7	113.3
1989	112.1	122.1	121.4	135.0	91.8	92.4	110.5	111.2	120.4
1990	105.5	112.7	112.0	134.7	93.6	94.2	119.5	120.2	127.6

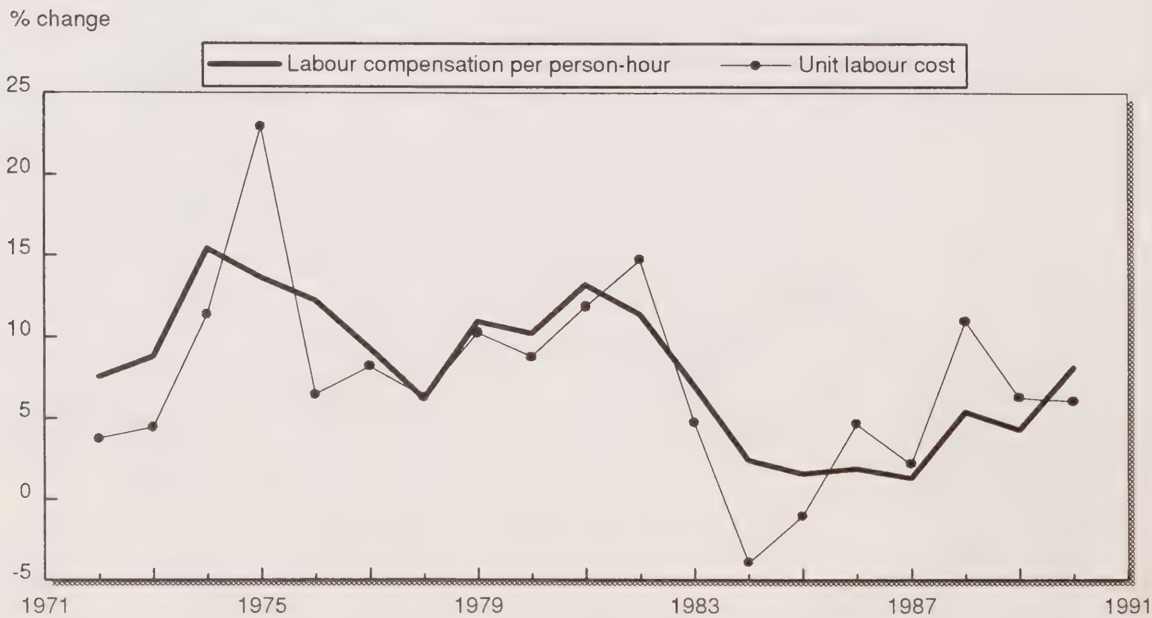


Table 27

Indices of labour productivity and unit labour cost, machinery industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	77.5	87.2	89.4	27.2	88.9	86.8	31.2	30.4	35.1
1973	85.0	91.8	93.5	30.6	92.6	90.9	33.3	32.7	36.0
1974	96.7	100.9	101.6	38.1	95.8	95.1	37.8	37.5	39.4
1975	96.2	107.7	108.0	45.3	89.4	89.0	42.1	41.9	47.1
1976	97.2	104.0	104.4	49.1	93.4	93.1	47.2	47.0	50.5
1977	99.5	103.5	102.3	53.7	96.2	97.3	51.9	52.5	54.0
1978	105.0	105.7	105.9	59.8	99.3	99.1	56.6	56.5	57.0
1979	120.6	114.7	114.4	71.2	105.1	105.4	62.1	62.2	59.0
1980	122.4	121.4	120.5	83.2	100.8	101.6	68.5	69.0	68.0
1981	118.4	118.7	116.9	93.5	99.7	101.3	78.7	80.0	78.9
1982	88.2	100.4	98.1	86.2	87.9	89.9	85.9	87.9	97.8
1983	78.0	89.1	87.4	78.7	87.6	89.3	88.4	90.1	100.9
1984	94.5	93.1	92.7	86.3	101.5	102.0	92.8	93.2	91.4
1985	96.5	95.5	95.2	92.3	101.0	101.3	96.6	96.9	95.7
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	98.0	105.5	106.7	106.5	92.9	91.9	101.0	99.9	108.7
1988	109.4	116.7	116.8	122.9	93.8	93.7	105.3	105.2	112.3
1989	110.5	121.0	120.6	131.9	91.3	91.7	109.0	109.4	119.4
1990	102.5	109.0	109.8	131.5	94.0	93.4	120.6	119.8	128.3

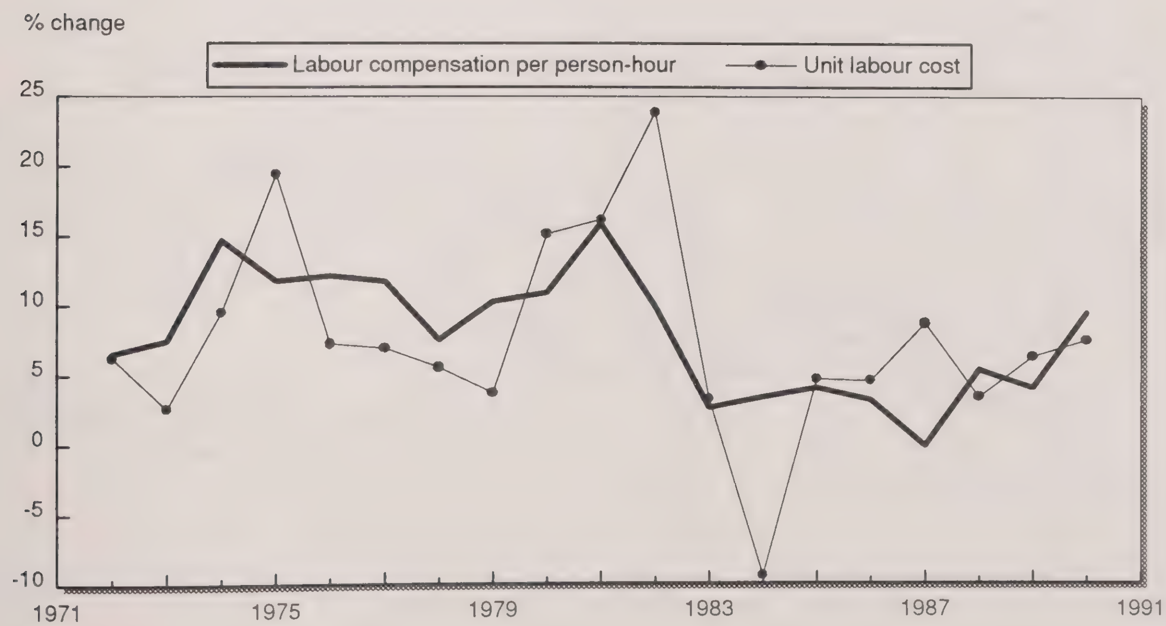


Table 28

Indices of labour productivity and unit labour cost, transportation equipment industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	59.9	78.3	77.4	22.1	76.5	77.5	28.2	28.6	36.9
1973	70.5	86.2	85.2	26.1	81.8	82.8	30.3	30.6	37.0
1974	70.7	85.0	82.6	28.8	83.2	85.7	33.9	34.9	40.8
1975	72.4	79.1	77.1	30.1	91.6	94.0	38.1	39.1	41.6
1976	78.4	82.0	79.0	35.7	95.6	99.1	43.5	45.1	45.5
1977	81.5	83.0	81.5	40.4	98.3	100.0	48.7	49.6	49.5
1978	84.2	88.6	84.8	46.7	95.0	99.3	52.7	55.0	55.4
1979	84.3	93.7	87.6	52.3	90.0	96.3	55.9	59.8	62.1
1980	65.3	87.9	81.6	53.4	74.2	80.0	60.8	65.4	81.8
1981	72.0	87.9	82.3	62.3	81.9	87.5	70.9	75.7	86.5
1982	66.0	80.2	73.9	61.0	82.3	89.3	76.1	82.6	92.5
1983	75.7	80.9	77.2	67.5	93.6	98.1	83.5	87.5	89.2
1984	95.9	91.3	89.9	82.7	105.0	106.7	90.6	92.0	86.2
1985	102.6	98.4	97.4	94.6	104.2	105.3	96.1	97.2	92.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.6	101.9	103.2	105.5	97.7	96.4	103.6	102.2	106.0
1988	118.1	108.6	108.9	117.0	108.8	108.4	107.8	107.4	99.1
1989	124.7	112.4	108.7	123.2	111.0	114.8	109.6	113.4	98.8
1990	117.1	105.9	99.7	121.2	110.6	117.4	114.5	121.5	103.5

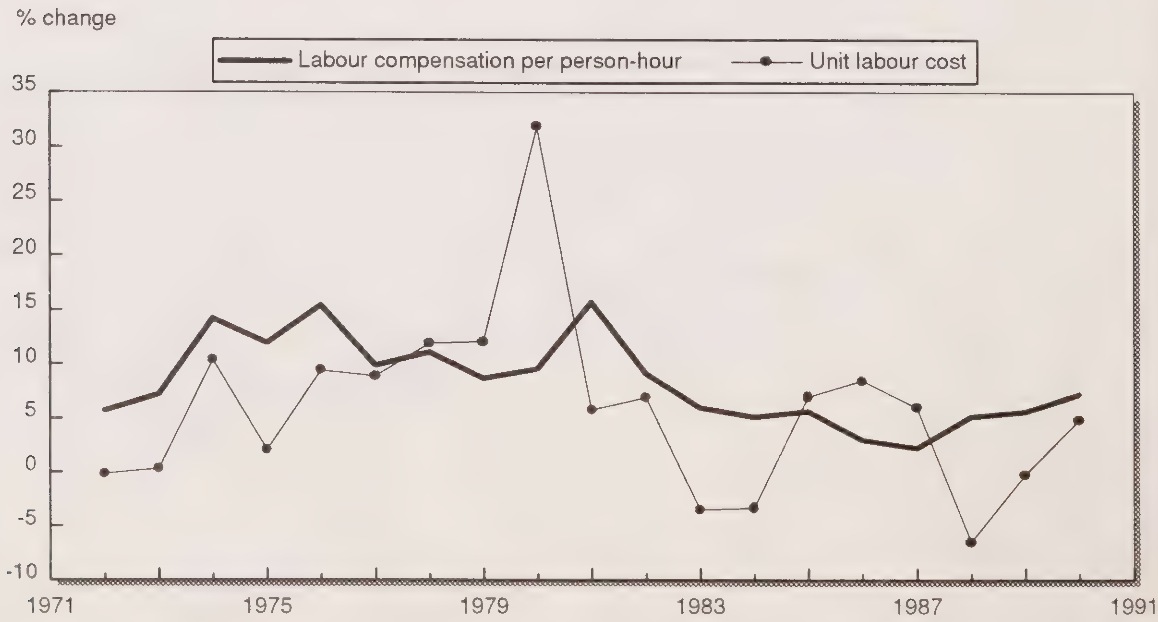


Table 29

Indices of labour productivity and unit labour cost, electrical & electronic products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	41.5	98.8	101.3	27.5	42.0	40.9	27.9	27.2	66.4
1973	47.5	104.6	107.5	31.0	45.4	44.2	29.6	28.8	65.2
1974	49.4	109.1	111.5	36.7	45.3	44.3	33.6	32.9	74.3
1975	44.6	102.4	104.1	39.3	43.5	42.8	38.4	37.7	88.1
1976	47.4	99.4	100.2	43.1	47.7	47.3	43.3	43.0	90.8
1977	47.5	90.8	91.3	43.3	52.3	52.0	47.6	47.4	91.1
1978	47.7	92.9	94.1	47.6	51.3	50.6	51.3	50.6	99.9
1979	57.4	98.6	99.3	56.5	58.3	57.9	57.3	56.9	98.4
1980	64.2	101.9	101.9	63.9	63.0	63.0	62.7	62.7	99.6
1981	72.2	107.7	107.6	75.7	67.1	67.1	70.3	70.4	104.8
1982	66.6	99.3	99.0	77.9	67.1	67.3	78.5	78.7	116.9
1983	66.9	94.6	94.8	80.7	70.8	70.6	85.4	85.2	120.6
1984	86.3	100.5	99.7	90.0	85.8	86.5	89.5	90.3	104.3
1985	95.7	101.4	102.7	96.5	94.4	93.2	95.2	94.0	100.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	110.7	106.4	107.4	111.0	104.1	103.1	104.3	103.4	100.2
1988	119.4	111.3	111.2	120.6	107.3	107.4	108.4	108.4	101.0
1989	126.6	111.9	112.7	125.4	113.2	112.4	112.0	111.3	99.0
1990	126.2	104.6	105.6	124.4	120.7	119.5	119.0	117.8	98.6

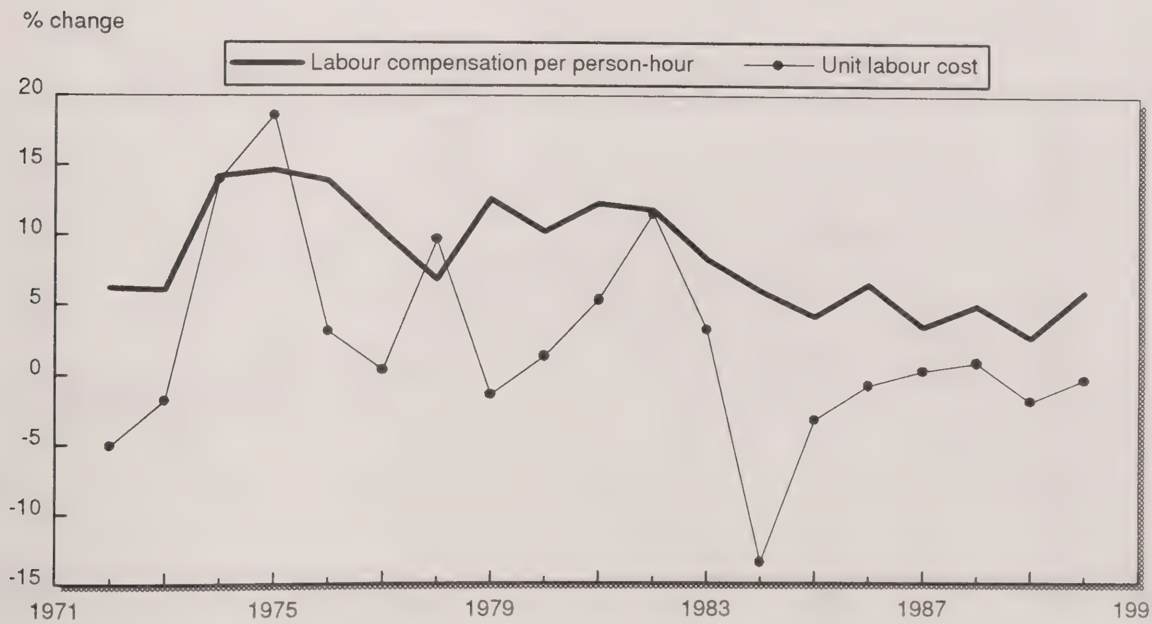


Table 30

Indices of labour productivity and unit labour cost, non-metallic mineral products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	98.3	101.0	106.1	29.1	97.4	92.7	28.8	27.4	29.6
1973	107.1	106.6	110.8	32.9	100.5	96.7	30.9	29.7	30.7
1974	109.4	110.2	113.5	38.8	99.3	96.4	35.2	34.1	35.4
1975	101.9	107.5	110.7	43.5	94.8	92.1	40.5	39.3	42.7
1976	104.8	106.4	108.4	49.1	98.4	96.6	46.1	45.3	46.8
1977	100.8	102.0	104.0	52.5	98.8	96.9	51.4	50.4	52.1
1978	108.1	104.6	106.4	57.9	103.4	101.6	55.3	54.4	53.5
1979	111.8	106.6	108.0	64.8	104.9	103.5	60.8	60.0	58.0
1980	98.2	105.0	104.0	69.2	93.5	94.4	65.9	66.6	70.5
1981	94.5	104.5	102.9	77.9	90.4	91.8	74.6	75.7	82.5
1982	72.4	90.7	88.2	73.8	79.8	82.1	81.4	83.7	102.0
1983	80.2	88.9	88.0	77.1	90.2	91.1	86.7	87.6	96.1
1984	87.8	91.4	91.2	82.6	96.0	96.3	90.4	90.6	94.1
1985	95.8	94.6	94.2	90.9	101.2	101.7	96.1	96.6	94.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	109.6	106.2	107.8	109.7	103.2	101.7	103.3	101.7	100.1
1988	111.3	108.1	110.5	116.6	103.0	100.7	107.9	105.5	104.7
1989	108.7	107.2	110.0	119.0	101.4	98.8	111.0	108.1	109.4
1990	98.5	102.2	103.7	118.0	96.4	95.0	115.5	113.9	119.8

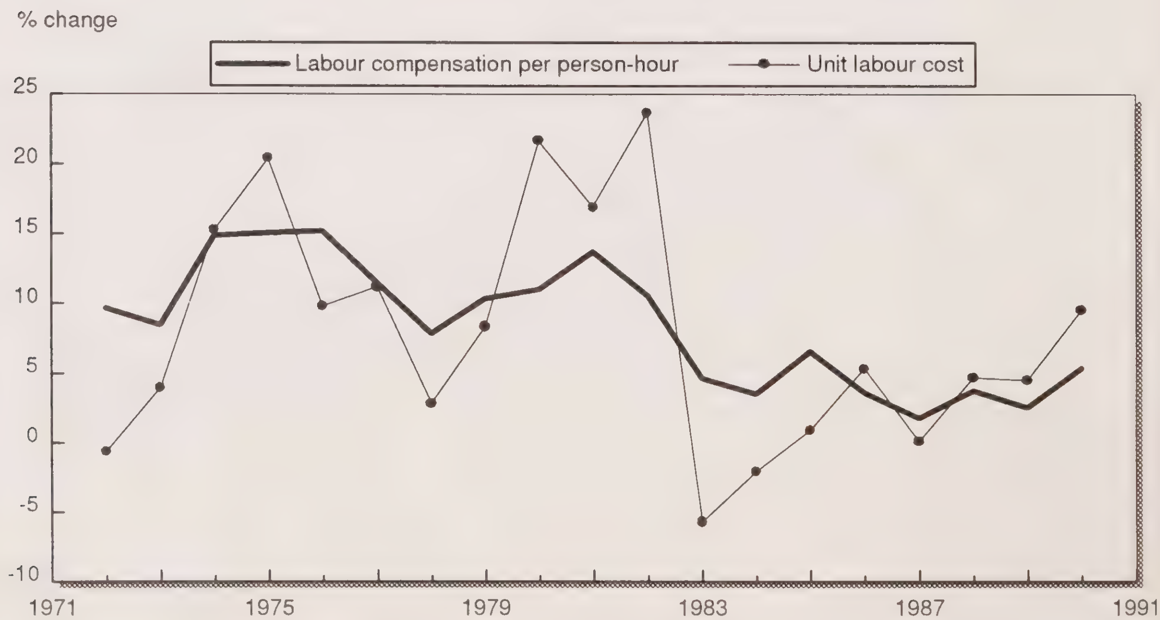


Table 31

Indices of labour productivity and unit labour cost, refined petroleum & coal products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compen-sation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compen-sation per person	Compen-sation per person-hour	Unit labour cost
1972	70.3	99.5	99.7	25.2	70.7	70.5	25.3	25.3	35.8
1973	103.2	104.3	103.1	28.4	98.9	100.1	27.2	27.5	27.5
1974	105.0	115.0	113.2	35.4	91.3	92.8	30.8	31.3	33.7
1975	113.4	113.0	108.4	41.6	100.4	104.7	36.8	38.4	36.7
1976	106.0	112.4	107.0	46.5	94.3	99.1	41.3	43.5	43.9
1977	132.2	119.9	113.7	54.6	110.3	116.3	45.5	48.0	41.3
1978	118.9	137.2	131.1	64.6	86.6	90.6	47.0	49.2	54.3
1979	97.9	126.5	122.2	65.6	77.3	80.1	51.8	53.7	67.0
1980	96.1	131.8	125.9	75.4	72.9	76.3	57.2	59.9	78.5
1981	111.3	153.1	146.9	100.7	72.7	75.8	65.8	68.5	90.5
1982	103.2	146.4	137.5	116.1	70.5	75.0	79.3	84.5	112.6
1983	102.7	125.7	126.5	111.6	81.6	81.2	88.8	88.3	108.8
1984	103.5	114.5	116.1	107.7	90.4	89.2	94.1	92.8	104.0
1985	100.8	111.9	114.9	107.5	90.1	87.8	96.0	93.6	106.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.3	98.4	100.5	104.8	107.1	104.8	106.6	104.3	99.5
1988	108.0	101.8	100.4	107.7	106.1	107.6	105.8	107.3	99.7
1989	112.7	111.6	111.0	122.4	101.0	101.6	109.7	110.3	108.6
1990	120.8	100.7	100.2	114.2	120.0	120.6	113.4	114.0	94.5

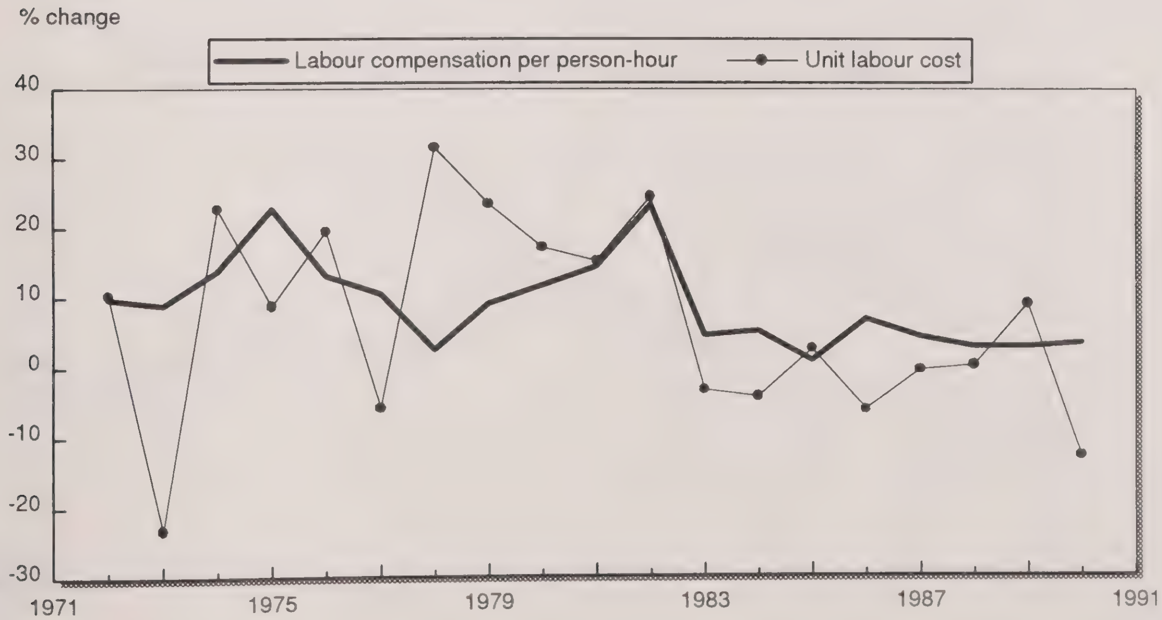


Table 32

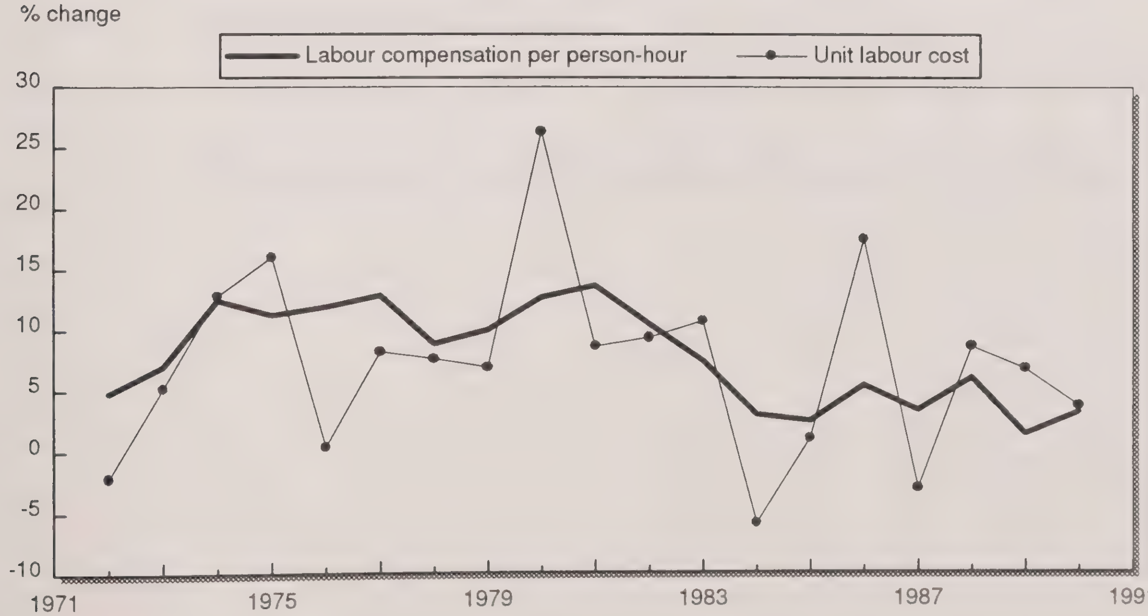
Indices of labour productivity and unit labour cost, chemical & chemical products industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity		Compensation per person	Compensation per person-hour	Unit labour cost
					Real GDP per person	Real GDP per person-hour			
1972	56.6	87.0	88.0	23.8	65.1	64.3	27.3	27.0	42.0
1973	64.3	90.2	91.2	26.3	71.3	70.5	29.2	28.9	41.0
1974	65.3	93.1	93.5	30.7	70.1	69.8	33.0	32.9	47.1
1975	58.5	93.6	94.3	34.9	62.5	62.0	37.3	37.0	59.6
1976	64.7	92.8	89.0	38.7	69.7	72.7	41.6	43.5	59.8
1977	70.5	95.3	96.0	44.1	74.0	73.5	46.3	46.0	62.5
1978	78.7	96.7	97.6	48.4	81.3	80.6	50.1	49.6	61.6
1979	84.4	99.9	99.2	54.7	84.4	85.0	54.8	55.2	64.9
1980	79.4	99.5	98.5	61.4	79.8	80.6	61.7	62.4	77.4
1981	85.9	102.6	101.1	72.5	83.8	85.0	70.6	71.7	84.3
1982	76.4	101.3	98.7	78.5	75.4	77.4	77.5	79.5	102.8
1983	89.9	100.1	100.0	82.9	89.8	89.9	82.8	82.9	92.2
1984	98.4	100.2	100.4	89.1	98.2	98.0	88.9	88.7	90.5
1985	99.5	99.8	99.5	93.7	99.8	100.0	93.9	94.1	94.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	107.1	101.7	101.1	106.4	105.2	105.9	104.6	105.3	99.4
1988	114.5	107.4	108.1	115.5	106.6	105.9	107.6	106.9	100.9
1989	118.7	108.0	109.2	120.2	110.0	108.7	111.3	110.1	101.2
1990	119.9	107.7	108.7	127.1	111.4	110.3	118.0	116.9	106.0

Table 33

Indices of labour productivity and unit labour cost, other manufacturing industries (1986=100)

Year	Real gross domestic product	Persons at work	Person-hours	Labour compensation	Labour productivity: Real GDP per person	Labour productivity: Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
1972	84.6	86.8	90.7	26.6	97.5	93.3	30.7	29.4	31.5
1973	88.7	90.2	93.4	29.3	98.3	94.9	32.5	31.4	33.1
1974	92.5	94.0	97.8	34.5	98.4	94.6	36.7	35.3	37.3
1975	88.3	94.2	97.3	38.2	93.7	90.7	40.6	39.3	43.3
1976	98.7	95.9	97.7	42.9	102.9	101.1	44.8	44.0	43.5
1977	96.2	89.9	91.2	45.3	107.0	105.4	50.4	49.6	47.1
1978	99.3	92.0	93.2	50.3	108.0	106.6	54.6	54.0	50.6
1979	105.1	94.3	95.8	56.8	111.5	109.7	60.3	59.3	54.1
1980	93.0	94.3	95.2	63.6	98.6	97.8	67.4	66.8	68.3
1981	100.9	97.8	98.6	74.8	103.2	102.3	76.6	75.9	74.2
1982	93.9	91.2	90.8	76.1	102.9	103.4	83.4	83.8	81.1
1983	91.0	90.4	90.7	81.6	100.7	100.3	90.3	90.0	89.7
1984	103.7	93.2	94.4	87.5	111.3	109.9	93.9	92.6	84.3
1985	109.4	95.9	98.1	93.1	114.1	111.5	97.2	94.9	85.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.6	99.4	98.0	101.3	105.2	106.6	101.9	103.3	96.9
1988	109.7	106.9	105.3	115.3	102.6	104.1	107.9	109.5	105.2
1989	109.1	108.5	110.3	122.5	100.6	98.9	112.9	111.0	112.2
1990	107.9	107.8	109.7	125.0	100.0	98.4	116.4	114.5	116.4



APPENDIXES

1 - Basic Concepts and Methods

2 - Sources of Data

3 - Aggregation Parameters for Productivity Measures

4 - Quality Rating of Productivity Estimates and Related Data

5 - Productivity and Related Data in CANSIM

APPENDIX 1

Basic Concepts and Methods

Ideally, a productivity index is one that takes into account all paid resources that are used as inputs into the production process. A comprehensive measure, such as this, is called a *total factor*, or, alternatively, a *multifactor* productivity index. This is the focus of Part 1 of this publication. Productivity indices that take into account only a subset of the inputs such as, for instance, labour productivity indices, are called *partial* productivity indices. Labour productivity indices are presented in Part 2 of this publication. Part 2 also includes estimates of unit labour costs by industry.

The labour productivity estimates have a longer history than the rather recent multifactor productivity estimates. Consequently, they were not derived as partial indices of the multifactor productivity indices and they thus require a separate methodological description.

In particular, the labour productivity indices are based on a Laspeyres measure of real gross domestic product by industry which is not used in the multifactor productivity accounts. Hence, this appendix presents separately the basic concepts and methods used in the labour and the multifactor productivity accounts.

In the application of the concept of productivity, inputs and outputs must be clearly identified. They may refer to the entire Canadian economy and/or to various components of the economy. These components, in the Canadian System of National Accounts, are either *sectors* or *industries*. The productivity indices refer only to the productivity of the resources used by the *business sector* of the economy. In the Canadian System of National Accounts, the business sector "encompasses that group of transactors who produce goods and services for sale at a price which is calculated to cover costs and yield a profit..."[1]. An industry is defined, in the National Accounts, "as a group of operating units [establishments] engaged in the same or similar kind(s) of economic activity, e.g., coal mines, clothing factories, department stores, laundries"[2]. Industries include both business and non business establishments but can be sectored to include only business establishments. Both the labour and the multifactor productivity indices presented in this publication refer, either explicitly or implicitly, to business establishments only.

The productivity of the government sector can not be calculated at this time in the framework of the Canadian System of National Accounts. The output of non-business sector industries is difficult to measure because it is not normally sold on the market. This means that in general, output prices are not available for this sector. The conventional measure of real output for non-business sector industries is therefore constructed by deflating the value of output with input prices. By convention (for lack of a better alternative), this amounts to measure the real output of

1. *Robert B. Crozier, National Income and Expenditure Accounts, Volume 3, A Guide to the National Income and Expenditure Accounts, Definitions-Concepts-Sources-Methods (catalogue 13-549, 1975, p. 101).*

2. *The Input-Output Structure of the Canadian Economy, 1961-1981 (catalogue 15-510, p. 18).*

the government sector as being equal to its primary input use. As a consequence, the growth in output cannot diverge from the growth in inputs as required for a meaningful productivity measure[3].

1 - Labour Productivity and Unit Labour Costs

1.1 - Labour Productivity

Due to the fact that there are two alternative measures of labour input, there are, correspondingly, two measures of labour productivity. When labour input is measured in terms of persons at work, the labour productivity measure is *real GDP per person at work*; when it is measured in terms of hours worked the labour productivity measure is *real GDP per person-hour.* Both of these partial productivity indicators are constructed as a ratio of real output to labour input, and are presented in index number form. Real GDP per person-hour may be the more appropriate measure for most applications since it incorporates changes in the average number of hours worked per week, which has a tendency to decline over the long run.

Although labour input is an important determinant in the level of output, it is not the only one. Other inputs also contribute to the production process. Partial productivity indices that do not take these inputs explicitly into account are therefore subject to changes in these inputs as one of the component of the productivity ratio, namely the output level, is partly determined by these other inputs. Hence, a partial productivity index may rise through time either because these other inputs are used in larger quantity or because the efficiency of the production process improves or both. It follows that partial productivity indices such as the labour productivity indices are not precise indicators of overall productive efficiency.

1.2 - Output

The concept of output used in labour productivity measurement is the constant price Gross Domestic Product at factor cost by industry (excluding Government royalties on natural resources and rents of Owner-occupied dwellings). The output measures are calculated with 1961 prices for the period 1961 to 1971, with 1971 prices for the years 1971 to 1981, with 1981 prices for the years 1981 to 1986. Estimates in subsequent years are calculated with 1986 prices. These series were then rescaled to correspond to a 1986 reference year (i.e. 1986=100) for convenience, as 1986 is the base year currently in effect in the Canadian System of National Accounts. The rates of growth in the original series are not affected by the choice of reference year. A more complete description of the output measures is found in *The Input-Output Structure of the Canadian Economy 1961-1981* (Catalogue 15-510) and in *The Input-Output Structure of the Canadian Economy in Constant Prices, 1961-1981* (Catalogue 15-511).

1.3 - Labour Input

In principle, labour input should cover all labour services expended to produce a given output. This report presents two measures of labour services: persons at work and person-hours worked. Neither of these measures takes into account the changing quality of labour input as is the case when measuring multifactor productivity. But the underlying estimates of persons at

3. *Further detail on the industry coverage of the productivity measures in this publication can be found in Appendix 3.*

work and person-hours are the same in both set of productivity estimates. Thus, the aggregate labour inputs of different classes of labour are obtained by adding the number of persons at work or the number of person-hours across classes.

Persons at work denote all *paid* and *other-than-paid* persons engaged in the production of output. Other-than-paid workers include self-employed workers and unpaid family workers.

Person-hours worked are the sum of person-hours spent at the place of employment by persons at work, and therefore differ from a measure of "person-hours paid" by excluding vacation time, holidays, time lost due to illness, accidents, etc.

1.4 - Labour Compensation

Labour compensation is a measure of the value of labour services engaged in the production process. It includes all payments in cash or in kind by domestic producers to persons at work as remuneration for work, including wages, salaries and supplementary labour income of paid workers, plus an imputed labour income for self-employed workers. Statistics on labour compensation reported here represent the most comprehensive labour cost data available for all industries at the present time since they include both cash payments and supplements and cover all remunerated persons at work.

The estimate of the value of labour services of self-employed persons is an imputed value. The imputation is based on the assumption that the value of an hour worked by a self-employed person is the same as the value of an hour worked by an average paid worker in the same industry. This assumption is based on the premise that labour services are contracted on a temporal basis, and a measure of labour compensation should not reflect returns on investment or risk taking. An adjustment is made in the case of self-employed persons such as doctors, dentists, lawyers, accountants and engineers. In these cases, the average earnings of paid workers in the same industry tend to be lower than the earnings of the self-employed workers. Although self-employed workers are in majority in the industry, the imputation of earnings for these workers at the average rate in the industry tends to underestimate the income of the self-employed. In this case, direct evidence on average labour income of these workers is introduced.

Unpaid family workers, while not directly recompensed for their services, are not a free resource, and their contribution is reflected in the net income of the firm where they are employed. However, no labour income is imputed to unpaid family workers. There is no valid basis for measuring the value of their services, and it is judged that less error is generated by their exclusion from measures of labour compensation than by imputing labour income to them at the same rate as paid workers. The number of unpaid family workers is insignificant in most industries.

1.5 - Unit Labour Cost

Unit labour cost is the ratio of labour compensation to real GDP. It is a measure of the cost of labour per unit of real output. Unit labour cost can also be viewed as the ratio of average compensation to labour productivity; thus, unit labour cost will increase when average compensation grows more rapidly than labour productivity.

1.6 - Absolute Values

All time series in this report are presented as indices taking a value of 100 in 1986. This form emphasizes relative change, as opposed to levels, as being important in the construction of productivity measures and related cost series. One can reconstruct the absolute values underlying the indices of persons at work, person-hours, real gross domestic product and labour compensation. These absolute values are of some interest as they indicate the level of those series. Nevertheless, the growth rate of the series is the same whether it is calculated from the index or the absolute values.

Text table 1 gives the absolute values underlying the indices for the year 1986. To calculate the absolute values corresponding to the published indices the following procedure can be followed:

$$\frac{\text{Index}}{100} \times \text{1986 value from Text table 1}$$

The measurement of employment, output, and the other series mentioned above are subject to some, usually indeterminate, margin of error. These errors usually have a larger impact on the level of the estimates than on their growth rates. While such statistical errors will also have some effect on measures of relative change, it can be expected that their effect will be more serious when comparisons of absolute levels are attempted.

Text table 1

Absolute values of labour productivity and unit labour cost, 1986

Industry Title	Real gross domestic product	Persons at work	Person-hours	Labour compen-sation
	$'000,000	'000	000,000	$'000,000
Business sector industries	335,673	8,553	15,298	225,727
Business sector - excluding agricultural and related services industries	324,616	8,059	14,216	220,196
Business sector - services	173,374	5,244	8,993	126,868
Business sector - goods	162,299	3,309	6,305	98,859
Agricultural and related services industries	11,057	493	1,082	5,531
Manufacturing industries	86,789	1,804	3,341	56,919
Construction industries	28,082	673	1,242	23,449
Transportation and storage industries	20,254	459	856	14,857
Communication industries	13,248	200	372	7,628
Wholesale trade industries	23,312	558	1,066	17,128
Retail trade industries	28,269	1,433	2,343	23,949
Community, business and personal services industries	52,119	1,990	3,286	41,921

2 - Multifactor productivity

2.1 - Multifactor Productivity in a Nutshell

Although the partial labour productivity indices described above are appropriate for many analytical uses, they do not describe exhaustively the sources of economic growth. This is the case because measured changes in output per unit of labour input are not necessarily attributable to the contribution of labour alone, but also to the contribution of other productive resources and to the effectiveness with which all are combined and organized for production.

On the other hand, the multifactor productivity accounts intend to measure the performance of the Canadian economy in production activities by taking the contributions of all productive resources into account. It is assumed that resources are optimally allocated between the various production activities so that the object of the performance indicators is solely to reveal the technical *efficiency* with which the available resources are used in each of these production activities or groups of activities.

In general, productivity gains are measured in a residual fashion as the growth in output not accounted for by the growth in production factors explicitly listed in the chosen formula. Multifactor productivity measures output per unit of all factors of production combined (such as labour, capital, materials and services used as inputs in the production of goods and services). Consequently, multifactor productivity does not reveal the contribution of the production factors but the joint effects of technical progress, economies of scale, and other factors not explicitly taken into account.

This publication presents two complementary categories of multifactor productivity indices. One category takes into account only the direct productivity gains made by an industry without considering the indirect productivity gains made by its suppliers. The other looks at the productivity gains made in the production of the goods and services of an industry by taking into account the productivity gains made by all industries which contributed directly and indirectly to that production. This measure basically consists in a measure of productivity by product category rather than by industry.

The first category of indices, based on the most usual concept of multifactor productivity, measures the productivity gains taking place within an industry, from the point of view of that industry taken in isolation from the rest of the business sector of the economy. The index measures the growth in the *gross output* of an industry unaccounted for by the growth in all of its factors of production; that is, both the inputs called primary, which are the labour and capital inputs, and the intermediate inputs, which are the materials and services purchased from other industries. This index does not take into account the productivity gains which take place in the industries which produce these intermediate inputs[4]. We will refer to this index as the industry index. Because the industry index does not account for the productivity gains realized in other industries, it can be viewed as a tool to assess productivity gains in a static partial equilibrium framework.

4. *Except in variant of this index for intermediate inputs originating from the industry itself as will be explained below.*

The second category of productivity indices takes into account the productivity gains realized in the upstream industries supplying intermediate inputs[5]. The index measures the growth in the output of an industry unaccounted for by the growth in all its primary inputs as well as by the growth in the primary inputs used in the production of its intermediate inputs by its direct and indirect industry suppliers. In that perspective, the interindustry productivity index takes into account all the primary inputs which have been used in *the business sector as a whole* to produce the goods and services of a given industry. In other words, each industry is viewed as an integrated component of the business sector of the economy rather than as an isolated entity. The interindustry indices can thus be considered as estimates of multifactor productivity gains in a static general equilibrium framework.

Both measures of productivity are useful. For instance, in an effort to assess the performance of an economy as a whole in the production of some bundle of goods, it would be inappropriate to consider the declining industries with low productivity gains without also looking at the performance of the industries supplying them with goods and services. The latter industries, which may benefit from important productivity gains, may also be strongly dependent on the low performance industries for the sale of their output.

2.2 - The Concept and Measurement of Multifactor Productivity

The *level* of multifactor productivity is a ratio between the level of production of industries and the quantity of all inputs they use. Although there may be alternative ways to compute the productivity ratio, all of these consist in combining all the goods and services produced into a single *aggregate output index* and, likewise, all of the production factors used into a single *aggregate input index.* The aggregation of the goods and services produced or used in the production process requires that these goods and services be measured in some common units. Similarly to the weights and measures in physics, index numbers use the relative value of the goods and services at some specific point in time as the common unit of measure. They are in fact weighted averages where each good/service is attributed a weight according to its contribution to the value of the aggregate of which it is a part of. Thus, the greater the nominal value of the good/service, the larger share it will have in the aggregate[6]. The multifactor productivity index *level* is computed as the ratio of the aggregate output index to the aggregate input index. Productivity *growth* is positive if the aggregate output index grows faster than the aggregate input index. Productivity decreases in the opposite case.

For empirical applications, some choices have to be made on how to actually measure inputs and outputs. The most widespread choice at the industry level is the *gross output* measure. The gross output of an industry is the aggregate volume of all goods and services produced and work done by the industry. Gross output can be defined as either including or excluding intra-industry sales as will be discussed further below.

Correspondingly, on the input side, the measure of the index has to be inclusive of all used (and measurable) inputs which can be classified into two broad categories: (1) *intermediate* inputs

5. *The concept and the empirical estimates were first introduced by T.K. Rymes and A. Cas in a study done for Statistics Canada between 1983 and 1985 and published later. See Cas A. and T.K. Rymes (1991), On Concepts and Measures of Multifactor Productivity in Canada, 1961-1980, Cambridge University Press, New York. However, contrary to Rymes and Cas, we include the capital stock in the primary inputs rather than in intermediate inputs.*

6. *This can be established more formally as the Divisia aggregation formula for a twice differentiable linearly homogeneous production function under competitive market conditions and profit maximization. The time continuous Divisia index is approximated by the chained Tornqvist index.*

which are comprised of the many goods (raw materials) and services purchased by the industries, and (2) *primary* inputs including labour inputs, capital inputs, and natural resources. More precisely, intermediate inputs are considered to be those inputs which are produced and are consumed during the same period (usually a year) by the business sector. The primary inputs[7] are supplied from other sectors of the economy such as the household sector. As discussed further below, imports and a few other variables can also be included in the set of primary inputs.

In the estimation of the multifactor productivity indices, a more detailed breakdown of both the inputs and outputs by commodity were used as described in Appendix 3. The more disaggregated (and consequently more homogeneous) set of commodities used improves the quality of the measured productivity indices and presents a definite advantage over the more aggregated (and more heterogeneous) set of commodities usually used by other investigators. However, due to statistical limitations, natural resources are not presently included in the input set. It is hoped that natural resources will be included in the future as estimates of their prices and uses become available. It is believed that this data shortage has implications mostly for the quality of estimates of resources industries but that it has little impact on the estimates of other industries.

The multifactor productivity indices have an important advantage over the partial labour productivity indices. This advantage stems from the inclusion of all the major factors contributing to the growth of output in the economy. Output growth is thus accounted for by increases in productive capacity, by a greater use of various services and goods purchased by industries (including energy) and by the growth in labour input. As mentioned above, output growth which is not accounted for by the growth of inputs is called productivity. Therefore, the more detailed and inclusive is the list of production factors entering into the estimates, the more the growth in output can be "explained".

The inclusion of all production factors in the computation of productivity indices does not preclude the computation of meaningful indices of partial productivity. However, in order to analyze and to explain the partial productivity of any contributing production factor, one must first express its productivity in relation to the contribution of the other production factors. For instance, the index of partial labour productivity may have increased because the quantity of equipment, raw materials, and energy used per unit of labour have increased. Only when the contribution of these other factors have been netted out can the partial labour productivity be meaningfully related to factors such as education and experience. Multifactor productivity presents a net advantage on this count compared to labour productivity, precisely because it allows the decomposition of increased labour productivity between the portion which comes from the contribution of the other production factors, and the portion which comes from factors explaining the increased efficiency of labour, such as education. The labour productivity indices presented in this publication do not allow such a decomposition.

7. *Capital goods are commodities produced by the business sector like intermediate inputs. However, they are accumulated only if savings occur. Capital goods are supplied to the business sector at the beginning of each period by the households which are the asset holders of the economy. In addition, they are excluded from the intermediate input set on the grounds that they are, by definition, not totally consumed during the period in which they have been produced.*

2.3 - Which Resources and How are they Measured?

Unemployed resources are excluded from the computation of productivity. Thus, for example, the labour input is measured with persons at work or hours worked rather than with the available labour force. The productivity indices, consequently, do not measure the performance of the economy as a whole which is often reduced by the non-utilization of available resources. Rather, the productivity indices presented here intend to track the evolution of the technical performance of the production processes which would obviously not be well captured if unemployed resources were taken into account.

On the other hand, resources engaged in the production process may not be fully employed as is often the case in economic downturns. Labour hoarding is a classical example: in response to decreasing demand for its product, an establishment may not lay off its employees for various reasons such as separation costs and the cost of training new employees when operations expand later on.

No adjustment for capacity utilization of inputs is explicitly made to the multifactor productivity indices with one important exception. An adjustment is made to take into account the capacity utilization rate of capital by calculating the cost of capital, that is, its share in the index of combined inputs, in a residual manner rather than by calculating it using the user-cost-of-capital approach (interest rates, depreciation rates, and other variables affecting the price of capital services)[8].

However, this correction does not fully eliminate the cyclical fluctuations of the indices and, consequently, does not reveal the trend followed by technical progress. This may be due to the fact that capital is not the only quasi-fixed factor. We just mentioned above the phenomena of labour hoarding. Short run disequilibrium may also act on the measure as well as scale economies and errors in the data.

However, over the long run, that is from peak to peak in economic activity, the indices do in fact reveal the increased productivity associated with technological possibilities, either in the form of technical progress or through a better use of all available technologies.

2.4 - Alternative Measures of Multifactor Productivity

2.4.1 Two categories of productivity measures. An industry rarely carries out all of the transformations from basic materials to final products. The automobile industry, for instance, uses steel as an intermediate input, which has been produced by the steel industry. Rarely are automobile producers involved in steel manufacturing. The production of steel is part of the total transformation processes involved in the production of automobiles but it is not part of the transformation processes of the automobile industry itself. Thus, if one is interested in the productivity of all the production processes involved in the production of the output of the automobile industry, one must *integrate*[9] *the productivity of activities of all industries* having participated in such production. This would embrace the industry directly involved in the manufacturing of automobiles (the automobile industry) as well as those industries indirectly

8. *See Berndt, E.R. and Fuss, M.A., "Productivity Measurement with adjustments for variations in capacity utilization and other forms of temporary equilibrium", Journal of Econometrics 33 (1986) 7-29, North-Hollard.*

9. *For a full discussion of the concept of integration in relation to productivity measurement, see Durand R., "Aggregation, Integration and Productivity Analysis: An Overall Framework", Aggregate Productivity Measure, 1989, Statistics Canada, (catalogue 15-204), pp. 107-118.*

involved in supplying the automobile industry with all the necessary parts, materials and services (all the "upstream" industries, such as the steel industry). The *interindustry* productivity estimates pertain to the productivity of groups of industries linked to each other by the flow of intermediate goods and services. Since this measure covers all industries, it can be considered as the productivity of the economy in producing a given bundle of goods or as a product group index of productivity.

From the point of view of the industry, the sources of inputs, whether intermediate or primary, do not matter. From that perspective, inputs are considered as given to the industry although for the economy as a whole these resources had to be either (1) produced by other industries, (2) imported or (3) supplied by households in the form of capital and labour. From that point of view, the industry, *as an isolated entity*, is the universe over which productivity is computed. This is the essence of the *traditional view* on productivity.

The new *interindustry* perspective on productivity is equivalent to the perspective of an observer whose concern lies in the efficiency with which the scarce resources of the *economy as a whole* are being used. One may, in particular, be interested in the efficiency with which an industry, as a component of the business sector rather than as an isolated entity, uses the scarce primary resources available to the business sector of the economy, whether directly or indirectly, by purchasing goods and services from other industries. The latter industries use both primary and intermediate inputs but the intermediate inputs they use also originate from upstream industries so that, going through all interindustry transactions, all intermediate inputs can ultimately be accounted for by uses of primary inputs.

In the example of the automobile industry, the inputs are capital and labour and the intermediate inputs it purchases, such as steel. The inputs of the steel industry include capital and labour inputs and the intermediate inputs it purchases, such as steel ingots. In turn, the steel ingot industry uses its own inputs including capital, labour, as well as iron ore from a mine it owns. When considering the interindustry set of inputs, we know that it takes capital and labour in the ingot industry to extract the ore and to produce ingots, and that it takes the capital and labour of the steel industry to transform the ingots into steel. Downstream, the automobile industry also needs capital and labour to transform the steel into automobiles. Thus, the set of inputs in the interindustry measure of productivity now includes the capital and labour services used directly and indirectly in the production of automobiles. In this perspective, the interindustry concept *integrates* the contribution of upstream industries to the production of its output bundle.

The real degree of vertical integration of industries is constantly changing through the years. It is also quite different from one country to another. Therefore, the comparisons of productivity growth through time or across countries based on the conventional industry indices are always limited by the changing degree of integration through time or the varying degree of integration across countries. At a very disaggregated level, this statistical instability of the traditional productivity measures may become important. Indeed, the industries' establishments may not only be more or less vertically integrated but they can also migrate from one industry to another as their output mix changes through time. By vertically integrating all industries in their calculation, the interindustry productivity indices become insensitive to such "statistical" influences, given these indices an advantage over the industrial measures. Indeed, they measure the productivity of the same production processes whatever the industries in which these processes took place.

From the point of view of the individual interested in the global performance of the business sector as a whole *in the production of some group of commodities*, in particular for international

trade studies, the interindustry measure may prove to be more interesting than the traditional industry measure. Indeed, it takes into account not only the efficiency with which various inputs are combined within some industry to produce a given group of outputs but also the efficiency of the industries supplying the intermediate inputs. Thus, to take the example of the motor vehicle industry, this measure takes into account not only the efficiency of the assembly plants, but also the efficiency of the plants producing the auto parts and other raw materials, even including the production of basic minerals and other industries' output located far upstream in the chain of production. The national economy may possess very efficient assembly plants as compared to foreign plants but still remain disadvantaged on the international automobile market because of the relative inefficiency of the industries which “feed” its motor vehicle industry.

In fact, it seems advantageous to use both measures of productivity as they provide complementary information. The industry measure isolates the efficiency of the motor vehicle industry segment in the production of automobiles. The joint use of both measures allows the analysis of the overall efficiency of production processes (vertically integrated industries) as well as the efficiency of each of its (isolated industry) segments.

2.4.2 Two concepts of gross output. As mentioned above, in addition to the standard gross output measure derived from the input-output tables, one may adopt another production concept for the purpose of estimating multifactor productivity: the gross output net of all intra-industry flows. According to Gullickson and Harper[10],"...removing intra-industry transactions assures that changes in vertical integration through time in the census data do not bias the estimates." This advantage refers only to intra-industry integration while the interindustry measure introduced above possesses the same advantage over both intra- and interindustry sales.

The concept of net-gross output[11] has the further advantage of smoothing the aggregation process. According to the traditional approach, the concept of gross output is maintained at all levels of aggregation except at the total business sector level where the productivity measure based on value-added is considered. Even for broad aggregates such as goods industries and services industries, multifactor productivity measures are defined on gross output while productivity of the business sector is defined on value-added. The measure of output is therefore abruptly changed from gross output for broad aggregates to value-added for the total. In contrast, the net-gross output measure converges gradually towards value-added as, when moving to broader aggregates, intermediate inputs are progressively reclassified from *interindustry* sales to *intra-industry* sales and subtracted from gross output. As a counterpart, the concept of net-gross output has the disadvantage that productivity estimates depend on the level of aggregation as the more aggregated so the more integrated they are. Detailed industry productivity estimated, therefore, cannot be compared to aggregate estimates.

2.5 - Aggregate Business Productivity

The discussion of the various concepts has hitherto been made with reference to the industry or commodity group as the main subject. What about multifactor productivity measures for the total business sector? What impact has the aggregation level on the definition of output and inputs? The answers to these questions are the main focus of this section.

10. W. Gullickson and M.H. Harper, "Multifactor Productivity Measurement for Two-Digit Manufacturing Industries", paper presented at the 1986 meeting of the Western Economic Association in San Francisco, July 1-5, 1986.

11. For a full discussion of the net-gross output concept of productivity, see Diaz, A. “Alternative Concepts of Output and Productivity”, Aggregate Productivity Measures 1989, Statistics Canada, catalogue 15-204, pp. 97-106.

If we wish to measure the productivity of the business sector in producing goods and services to be sold outside the sector, the industrial measure of multifactor productivity based on gross output is inadequate. The sum of the gross outputs of all industries in the business sector corresponds to much more than the outbound production as it includes all goods and services bought by other industries and used as intermediate inputs in the production of other goods and services. This is why the aggregate productivity index on gross output is not calculated in the framework of Statistics Canada's productivity program.

The question is now: what are the appropriate measures of productivity at the aggregate level? First, let us consider the net-gross output model, where intra-industry sales are netted out from both output and inputs. In this model, the output includes the production of goods and services delivered outside the sector and the inputs include all the resources available to the business sector, that is its primary inputs (labour and capital) and the inputs originating from the other sectors of the economy and from outside the economy (imports). On the other hand, the interindustry measure takes into account the direct and indirect primary inputs (capital, labour, and inputs originating outside the sector) used in domestic production. For the total business sector, the index based on net-gross output is equal to the interindustry index as both measures refer to the same inputs and output.

The two preceding measures are based on an approach that treats the business sector as an entity which is isolated from the rest of the economy and of the world. In this perspective, what matters is only the production delivered outside the sector and the inputs not produced by the business sector, whether they are imported or originating from other sectors (capital, labour). These measures statistically integrate the production activities within the business sector, but not with the rest of the economy or the world.

In contrast, the multifactor productivity measure based on value-added reflects the real degree of integration between the business sector and the rest of the world. From the perspective of the world economy, goods and services exchanged between countries are intermediate inputs. The fabricated inputs coming from outside the business sector (such as imports of goods and services) must not be counted in the inputs. The output therefore corresponds to the value-added of the business sector while the inputs include only capital and labour. Since the business sector is then considered as being integrated with the world economy, transactions with other parts of the world economy are deemed to be intraindustrial.

In summary, there are two measures which are relevant for the total business sector. First, there is the measure based on net-gross production and the interindustry measure which are equal, and second, there is the productivity measure based on value-added. The net-gross measure is sensitive to changes in the integration of the domestic economy with the rest of the world whereas the value-added measure is not because it already treats the inputs and outputs as if the domestic economy were completely integrated with the world economy.

2.6 - Usefulness of Productivity Indices in Economic Analysis

As indicated above, the main purpose of the multifactor productivity measures is to separate the observed growth in industrial production into increases in the economic resources employed by industries and increases in overall efficiency. This step allows a more complete accounting of the sources of economic growth than the partial measures presented in the framework of the Canadian System of National Accounts. Time series of multifactor productivity by industry also allow analysts to measure trends and detect shifts in competitive advantages among various

Canadian industries vis-a-vis similar industries in the rest of the global economy. By showing how industries' evolution has been influenced by their technical performance, the assessment of multifactor productivity helps analysts and policy makers to address such issues as domestic industrial policy and international industrial strategy. Similarly, businesses and other private organizations observe productivity movements to evaluate the long-term viability of various industries and make more informed investment decisions.

In addition, proper growth accounting opens the way to a better understanding of the sources of productivity growth. The latter can be conceptually decomposed into three components: economies of scales, technical progress and measurement errors due to omitted factors. Growth accounting paves the way to further analysis of the sources of economies of scale and technical progress. Taking technical progress as an example, it could be defined as the general advance in knowledge. If we accept this definition, then, over the long run, technical progress is the only source of *permanent and sustained* improvement in productivity. Indeed, at any point in time, the level of education of workers may be raised only to a certain limit through investments in education. Similarly, the diffusion of the best known technologies through investments in physical equipment has a limit as well as the best use of existing technical possibilities through economies of scale. Only investments in fundamental research in both human and natural sciences and investments in applied research and development can lead to a better and more educated labour force and better equipment over the very long run. Measuring the contribution of technical progress to the growth in output helps in understanding the importance of society's investment in such research.

APPENDIX 2

Sources of Data

This Appendix includes a description of data sources employed in the production of labour and multifactor productivity indices. As indicated in Appendix 1, labour productivity indices are not produced as partial multifactor productivity indices. Because both these index types are derived in part from different data sources, we describe their sources separately. More specifically, labour productivity indices are based on Laspeyres indices of Gross Domestic Product while multifactor productivity indices are calculated mainly from Törnqvist indices of gross and net-gross output. In spite of these differences, the measure of labour input, either employment or hours worked, are identical in both productivity measures.

The description of data sources is divided in two categories depending on whether data are preliminary or final. Final data are based on benchmarked data from the Input-Output Accounts as well as on statistics obtained from censuses and surveys, while preliminary data are based on other more up to date but less reliable data.

1 - Description of Labour Productivity Data

1.1 - Output

The output data used to calculate the indices of labour productivity and unit labour cost are the estimates of constant price Gross Domestic Product at factor cost by industry. The following sources are utilized: *The Input-Output Structure of the Canadian Economy in Constant Prices* (Catalogue 15-202) and *Gross Domestic Product by Industry* (Catalogue 15-001) for the years following the benchmark year. The data on real GDP in the Finance, Insurance and Real Estate Industries excludes real GDP of government royalties on natural resources and rents of owner occupied dwellings.

1.2 - Labour Input

The indices of productivity employ two alternative measures of the quantity of labour input used in production. One is the conventional measure of average annual persons at work and the other is the more precise number of hours these persons have worked. The description of sources for the employment and hours estimates applicable to the last four years are presented below[1].

1. *For further details about labour input data sources, the reader is referred to Indexes of Output Per Person Employed and Per Man-hour in Canada, Commercial Non-agricultural Industries, 1947-1963 (Catalogue 14-501) for the years 1946 to 1961 and to: Karnail S. Gill and Monique Larose, "Sources and Methods of Estimating Employment by Input-Output Industries 1961-1989", Input-Output Division Technical Series, #47, 1991.*

1.2.1 - Estimations of Persons at work

Persons at work. Persons at work are made up of two groups: *paid workers* and *other-than-paid workers.* The other-than-paid workers include self-employed and unpaid family workers. Up to the year of the preliminary input-output tables, the paid workers and other-than-paid workers estimates are produced at the most detailed level of the System of National Accounts. This represents employment estimates for 216 different industries, including the non-commercial sector.

Beginning in 1988, an important change has been made to the estimates of persons at work used in measures of productivity. The number of persons at work obtained as the average of the aggregation of the estimates of all industries obtained from different sources is reconciled to the employment obtained by applying the growth rate of total employment obtained from the Labour Force Survey to the 1987 employment level. The growth rate of commercial and non-commercial employment obtained from this survey also serves as annual benchmark. Any difference between the estimates is allocated between the trade industries and the Community, Business and Personal Services (excluding education and hospital industries) because employment data for these industries are considered less reliable. The same method is applied to the preliminary data described below.

Benchmark data for 1989 and 1990

Paid workers. The number of paid workers including multiple job holders in agriculture, fishing and trapping industries as well as for wholesale trade, and the accommodation and food industries is taken from the *Labour Force Survey* (Catalogue 71-001).

The mining, quarrying and oil well industries are broken down into four major groups according to the 1980 SIC:

1. Mining industries;
2. Crude petroleum and natural gas industries;
3. Quarry and sand pit industries;
4. Service related to mineral extraction.

The primary data source used for the first three groups is the *General Review of the Mineral Industries*, (Catalogue 26-201). The only exception is the oil sands industry, which falls into the second major group, crude petroleum and natural gas industries. This industry is not covered in the *General Review of the Mineral Industries*, and therefore the data used for this industry are taken from the *Survey of Employment Payroll and Hours*. The last major group, service industries incidental to mineral extraction, Employment, Earnings and Hours, Catalogue 72-002 has been used.

The source of the number of paid workers in manufacturing is *Manufacturing Industries of Canada: National and Provincial Areas* (Catalogue 31-203) a publication from the annual survey of manufactures.

The publication Employment, Payroll and Hours (Catalogue 72-002) is the source for the following industries:

Logging and forestry industries;
Construction industries (contract work);
Transportation and storage industries;

Other utility industries;
Finance, insurance and real estate industries;
Business service Industries;
Educational service industries;
Health and social services industries;
Personal and other service industries;
Non-commercial services.

In transportation and storage industries the following publications were used to derive the number of paid workers: *Air Carrier Operations in Canada* (Catalogue 51-002), *Rail Transport* (Catalogue 52-212; 52-215 and 52-216), *Gas Utilities: transportation and distribution systems* (Catalogue 57-205) and *Oil Pipeline Transport* (Catalogue 55-201), *Passenger Bus and Urban Transit Statistics* (Catalogue 53-215).

In the case of the four communication industries, paid workers data were obtained from: *Radio and Television Broadcasting* (Catalogue 56-204); *Cable Television* (Catalogue 56-205), and *Canada Post Corporation Annual.*

Among the industries in the above list, the construction industry requires a clarification. The Input-Output concept of the construction industry includes the construction activity contracted out as well as the activity carried out by the work force of all other industries. The latter activity is named Own-Account Construction. Given a lack of data on the employment directly affected to own-account construction, such employment is estimated from data on labour remuneration cost obtained from Construction in Canada, (Catalogue 64-201). The volume of labour employed in this activity is obtained as the ratio between own-account construction labour compensation and the average wage in the industry where the activity takes place. These volume is subsequently transferred to the business sector construction industry. In the 1980s, own-account construction activity represented about 25% of total construction activity.

Other-Than-Paid workers. The main data source for other-than-paid workers is the Labour Force Survey. However, the number of self-employed workers, medical doctors and dentists that belong to the Health and Social Services Industries (except hospitals) are obtained from Fiscal Statistics, Revenue Canada Taxation, (Catalogue RV 44).

Preliminary data for 1991 and 1992

Preliminary data is produced only at the "S" level of aggregation of the Input-Output tables. For the paid workers, the year-to-year change from *Labour Force Survey* (LFS) and *Survey of Employment Payroll and Hours* (SEPH) was applied to the 1990 absolutes values. For other-than-paid workers, the data were obtained entirely from the *Labour Force Survey.*

1.2.2 - Estimation of person-hours worked

Person-hours worked. The number of person-hours worked for each industry is obtained by the product between the number of persons at work and the average number of hours worked per person per year. Given the availability of employment data, the estimation of hour worked consist of estimating the average hours worked per year.

Benchmark data for 1989 and 1990[2]

The estimation of average hours worked per year up to the benchmark year is made at the "PL" aggregation level, i.e., for 112 industries. With the exception of the mining and manufacturing industries, all data on average hours worked are from the Labour Force Survey.

Monthly data from the *Labour Force Survey* refer only to the survey week, usually the week falling on the 15th day of the month. Respondents having worked during the reference week are asked a series of questions on hours worked. The questions concern regular hours, overtime hours, hours effectively worked as well as hours lost and the reason for work absence. This information allows a verification of each element of the response on hours and permits the estimation of total annual hours worked. Given that the statistics refer to a precise week of the month, annual data represent only the observation of hours corresponding to 12 survey weeks during the year. To estimate the effective hours worked during the all weeks of the year, a methodology was developed in the Productivity Measurement Section[3]. The goal of the methodology is to adjust the hours effectively worked reported by the survey in relation to two factors. One is the effect of holidays falling in the reference week, the other being the effect of time lost due to labour conflicts[4].

The method used to estimate annual hours worked from data originating in the *Labour Force Survey* has four main stages:

1- The first consists of adding estimates of hours lost due to holidays or labour conflict to the estimates of hours worked during the reference week. The result is an estimate of the hours than would have been worked in the absence of conflicts and holidays. These monthly data are then interpolated in order to obtain the estimates for the 52 weeks of the year.

2- The second stage is to adjust the estimates of hours worked by the hours lost due to holidays. This information is obtained directly from the *Labour Force Survey* in the case of holidays during the survey week. Those not in the survey week are estimated. This is done by identifying and classifying the main Canadian holidays in three categories 1) Most important (Christmas, New Year, Easter Monday, Canada Day, Labour Day, Thanksgiving), b) Important (Victoria Day, Boxing Day), and 3) less important (Easter Monday, St. Jean Baptiste/Civic Holiday, Remembrance Day)[5]. The classification reflects the fact that most employees have the right to the important holidays and that a smaller proportion have the right to other holidays. The number of hours lost for the three holiday types is estimated based on those of holidays corresponding to the same category falling during the survey week.

2. *For further details on hours worked data sources used to measure productivity indices for the years 1961 to 1988, see the feature article entitled "Hours Worked: A New Measure of Labour Input for Multifactor Productivity" by Jean-Pierre Maynard, Catalogue no. 15-204E, 1991.*

3. *For a complete description of this methodology, see: Maryanne Webber, "Estimating Total Annual Hours Worked from the Canadian Labour Force Survey", Input-Output Division Technical Series, #51, Statistics Canada, April 1983.*

4. *The employment concept of the Labour Force Survey includes as employees, any respondents that did not work during survey week due to labour disputes.*

5. *The classification of statutory holidays in order of importance comes from data collected by the Pay Research Bureau, a service of the Public Service Staff Relations Board of the Federal Public Service.*

3- the third stage consists of removing hours lost due to labour conflict[6]. It must be noted that only the statistics on paid workers are adjusted for this type of absence.

4- Finally, the average annual weekly hours worked is obtained by the average weekly hours after adjustment for labour stoppage and holidays. The average number of hours worked per year is obtained as the product of the weekly average by the number of weeks in the year. This last component is not constant but follows the vagaries of the calendar. A calendar year comprises 52 full weeks plus one day (two in leap years); if any of these days fall on a non-working day, the year has exactly 52 weeks, and exceeding this in all other cases. As a result, the number of hours worked may change from year to year due to fluctuations in the length of the year.

This method permits the estimation of average hours worked for paid workers with the exception of the mining and manufacturing industries and for the other-than-paid category for all industries, except manufacturing industries.

Data for the manufacturing industries are obtained from the annual Survey of Manufactures as well as from other surveys. The calculation of hour worked by production workers is different from that of salaried workers. The number of hours worked by production workers is obtained directly from the annual Survey of Manufactures. In the case of salaried workers, the survey only collects information on normal work hours and number of vacation days. The average hours worked by this last group are obtained by deducting from normal hours the number of hours not worked due to vacations and holidays. In the case of self-employed workers it is assumed that they work the same average hours as the paid workers in the same industry.

Hours worked data for each of the four mining industries are subject to a special methodology. The estimates for metal mines, non-metal mines and sand and quarrying and sand pits are estimated on the basis of data on hours worked by production workers derived from the *Census of Mines* to which we add the average hours paid of salaried employees from the Survey *on Employment, Payroll and Hours*. The latter are adjusted by means of data on average hours of paid absence calculated as the difference between hours paid and hours worked by production workers. Average hours for the oil and gas industry are obtained directly from the *Labour Force Survey*. Average hours in mining services are obtained from data on hours paid in the *Survey of employment, Payroll and Hours* to which an adjustment is made for time lost. To reflect the total paid workers for this industry, the total hours worked of the *Labour Force Survey* at aggregation level "S" (excluding oil and gas) is used as benchmark and allocated proportional to the share of each component estimated from the different sources described above.

Preliminary data for the years 1991 and 1992

In the case of recent years for which no *Survey of Manufactures* or *Census of Mines* data are available, we project benchmark data by the growth rate of hours worked of the *Labour Force Survey*.

1.3 - Labour Compensation

There are two components to labour compensation: labour income of paid workers and an imputed labour income of self-employed workers. The labour income of paid workers is taken

6. *For more information concerning this survey, refer to Collective Bargaining Review, Labour Canada, monthly.*

from *The Input-Output Structure of the Canadian Economy* (Catalogue 15-201), up to and including the year of preliminary tables. Data for the two most recent years are taken from *Estimates of Labour Income* (Catalogue 72-005) after adjustments are made to reroute own-account construction to construction industries of the business sector.

Labour income of other-than-paid workers. In addition to the labour income of paid workers, labour compensation includes an imputed labour income for all other-than-paid workers except unpaid family workers. The imputation is based on the assumption that the hourly income for the labour of self-employed persons is the same as that of paid worker in the same year and the same industry.

An adjustment is made in the case of some professional persons, such as doctors, dentists, lawyers, accountants and engineers. These occupations are largely self-employed, but the average earnings of paid workers in the same industry division underestimates the earnings of these occupations. In these cases their average labour income are obtained from *Taxation Statistics*, Revenue Canada Taxation, (Catalogue RV 44).

2 - Description of Multifactor Productivity Data

2.1 - Introduction

Prices and volumes for inputs and outputs used in multifactor productivity indices are based on estimates from several sources. For outputs and intermediate inputs by industry, the data are obtained from the current and constant price Canadian input-output tables[7]. Some transformation of these data are required to obtain better conceptual measures for the purpose of estimating multifactor productivity. These transformations are summarized in this appendix. Some of them were suggested by Rymes and Cas in an earlier study[8]. Primary input cost are also taken from input-output tables while their volumes are estimated from other sources. Labour input data are taken from the labour productivity program. Capital input data are described in a technical note which is summarized below[9]. The industry coverage of the business sector used for multifactor productivity estimates differ slightly from the usual definition of the national accounts as explained in more detailed in Appendix 3.

2.2 - Input-Output Commodity Data

The input-output tables are estimated at both *producers'* and *purchasers'* prices. Producers' prices are the prices received by the sellers at the boundary of their establishments. Purchasers' prices correspond to the market prices at the point of delivery and include various margins which are not taken into account in the producers' prices. Some of these margins are paid to business sector enterprises in exchange for real services such as retail and wholesale services and transportation services. Commodity indirect tax margins, on the other hand, represent a pure transfer without any real counterpart.

7. *For informations on data sources and concepts, refer to the Input-Output Structures of the Canadian Economy, 1961-1981 (Revised Data), Statistics Canada, Catalogue no. 15-510, Input-Output Division, 1987, pp. 1-127.*

8. *A. Cas and T.K. Rymes, "On Concepts and Measures of Multifactor Productivity in Canada, 1961-1980, Cambridge University Press, 1991.*

9. *For a detailed documentation on capital input, see Documentation of Capital Input and Capital Cost Time Series for Multifactor Productivity Measures, by M. Salem, Statistics Canada, Input-Output Division, September 1993.*

As the proposed productivity measures are derived under the assumption of competitive market behaviour, it can be argued that outputs of industries should be valued at producers' prices while the inputs should be valued at purchasers' prices. The Törnqvist index of productivity growth, which is used here, rests on the assumption of profit maximizing behaviour of firms in competitive markets. This implies that the marginal product of each input be equated to its real price defined as the purchasing cost on the input including all margins divided by the net selling price of the output, excluding all margins. But as real margins represent real inputs which can be substituted for other inputs over the long run, they were considered as distinct inputs rather than included in the physical volumes of the other inputs. Tax margins were included in the input set.

Conceptually, operating subsidies can be considered as negative indirect taxes. therefore, They were distributed over the input and output commodities to which they apply. Some subsidies, however, could not be attributed to specific commodities and were treated as non-commodity indirect taxes (see below).

Royalties were considered taxes levied on industries' outputs in the productivity accounts. They were subtracted from the producers' prices of outputs to estimate the net price received by producers. Royalties are considers as a rental income on natural resources received by the business sector industry *Government Royalties on Natural Resources* in the input-output tables. However, this is an improperly defined industry for productivity analysis as it has no inputs except for the *Other Operating Surplus* which is equated to the royalties received. The industry was also excluded on the grounds that it appeared doubtful that government act as a real monopoly on natural resources industries.

Input and output volumes for goods and services were taken from producer price input-output tables without any adjustment. The reason is that in constant prices, commodity indirect taxes represent a fixed proportion of inputs calculated for the base year such that their inclusion does not affect the growth rate of volumes.

Since government goods and services cannot be substituted by other business industry supply, they are added to primary inputs. As well, unallocated import and export commodities are considered as part of primary inputs. In general, all commodities which are not produced by the business sector are considered as primary commodities. This is the case, for instance, of the postal services. However, primary inputs other than capital and labour inputs are treated as intermediate inputs in the estimates of value-added productivity.

Dummy industries have been removed from the input-output tables. Corresponding dummy commodity inputs have been transformed into real inputs on the basis of the input structure of dummy industries.

2.3 - Labour Input at Current and Constant Prices

The employment and hours estimates agree with those used in the estimates of labour productivity. Sources were described in the first part of this appendix.

Labour compensation data are also identical to those used in labour productivity. However, it is important to mention that the imputation of self-employed income is deducted from the net revenue of individual businesses in the industry in order to maintain the accounting balance of the system. In addition, multifactor productivity labour input is weighted by the share of wages while labour productivity labour input is not weighted. Labour productivity labour input will be

weighted once the labour productivity estimates will be obtained from the multifactor productivity estimates. This will recognize the heterogeneity of labour categories.

2.4 - Capital Input at Current and Constant Prices

The input of capital services for a given year is assumed to be proportional to the capital stock in constant prices at the end of the previous year, net of depreciation. Capital stock excludes investments made during the current year because, in general, they are not productive at this stage. Depreciation follows a geometric curve. The choice of a geometric depreciation curve over a delayed one is still an open issue which will require further research[10].

Two particular problems occur when using the net capital stock figures from the Investment and Capital Stock Division: first, these data are based on the 1970 SIC while the input-output tables are on the 1980 SIC; secondly, these data are estimated for industries including all establishments, not only business sector ones as is the case of the input-output tables. Capital assets for industry segments have been estimated, removed from some industries and reclassified to others so as to maximize the number of concordant industry classes. Non-business industry capital stock was estimated and removed from the industries were significant differences were known to exist, namely, in non-metal mines, chemicals and chemical products, and other utility industries.

Contrary to the estimates of intermediate and labour inputs, capital input cost is estimated residually. It corresponds to the sum of other operating surplus (that is a residual item in the input-output tables), the net revenue of unincorporated businesses less the labour income of self-employed workers. Indirect taxes other than those on goods and services are added to the cost of capital (subsidies are deducted), because these taxes apply generally to property and the use of capital by the industry. The capital service price is calculated as the ratio between capital cost and the stock of capital of the previous year in constant prices.

10. In Canada U.S. comparisons, one must note that, in the Canadian measure of the capital stock, a more accelerated depreciation pattern is being used. For a more technical description of the new capital asset series, see Fixed Capital Flows and Stocks, Methodology, Investment and Capital Stock Division, Statistics Canada, May 1990.

APPENDIX 3

Aggregation Parameters for Productivity Measures

The statistics presented in this publication refer to business sector industries, as defined in the Canadian System of National Accounts. There are no corresponding statistics for non-business sector industries due to difficulties in the measurement of real output in this sector, as explained in Appendix 1.

1 - Aggregation Parameters for Labour Productivity and Related Data

The most detailed account of the business sector is defined in terms of individual industries from the *Standard Industrial Classification* (SIC). Aggregation of SIC industries generates 154 link (L) level industries (excluding the fictive industries), 47 medium (M) level industries and 13 small (S) level industries.

There are a total of 33 statistical tables on labour productivity appearing in Part 2 of this publication. Tables 1 to 4 are produced for special aggregates of business sector industries. Tables 5 to 12 correspond to selected S level business sector industries. The remaining tables, 13 to 33, are associated with the M level of the manufacturing industries.

Text tables 1 and 2 show the concordance between the classification of industries in the Canadian System of National Accounts used in labour productivity and the Canadian Standard Industrial Classification.

Text table 1

Concordance between "S" level industry codes, standard industrial classification codes (SIC's) and link codes

S Level Industries					
S Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
1	Agricultural & related services industries	011-017 021-023	001-0021	001-0021	1
2	Fishing & trapping industries	031-033	041-047	041-047	2
3	Logging & forestry industries	0411,0412 0511	031,039	031,039	3
4	Mining, quarrying & oil well industries	0611-0617 0619,0621- 0625,0629 063,071 081,082 091,092	051-052 057-059 061,064 071-073 079,083 087,096 098,099	051-059 061,063 066,071 073,077 079,083 087,092- 099	4-13
5	Manufacturing industries	(See M level below)			14-108
6	Construction industries	401-449	404-421	404-421	109-117
7	Transportation & storage industries	451-459 461,471 479,996 9991	501-509 512,515- 517,519 524,527	501, 502 504-509 512,519 515-517 524-527	118-128
8	Communication industries	481-483 4841	543-545 548	543-545 548	129-131
9	Other utility industries	491,492 499	572,574 579	572,574 579	132-134
10	Wholesale trade industries	501-599	602-629	602-629	135
11	Retail trade industries	601-692	10722-2611 631-699	1292,2611 631-699	136
12	Finance, insurance & real estate industries	701-705 709,711- 729,731- 733,741- 743,7499 7511,7512 759,761	7011-7016 7019,703 705,707 715,7211 7212,735 7371	702, 704 7311,7312 735,7371	137-139
13	Community, business, personal services industries	771-777 779,851- 859,861 8621,863 865,866 8671,8679 868,8691- 8693,8699 911-914 921,922 961-966 969,971 972,973 979,982 983,991- 995,9999 4842	801-809 821-827 841-845 849,851- 855,861- 864,866 867,869 871,872 874,876 877,879 881-886 891,8931 894-899	801-809 821,823- 827,851 853-859 861,862 864,866 869,871 872,874- 879,891 8931,894- 899	142-154

Text table 2

Concordance between "M" level industry codes, standard industrial classification codes (SIC's) and link codes

M Level Industries - Manufacturing

M Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
8	Food industries	1011,1012 102-104 1051-1053 106,1071 1072,1081- 1083,109	101-108	101,103 105,107 111,112 123-125 128,1291 131,133 135,139	14-24
9	Beverage industries	111-114	109,145,147	141,143	25-28
10	Tobacco products industries	121,122	151,153	151,153	29
11	Rubber products industries	151-159	1623,1629	163,169	30
12	Plastic products industries	161-169	1651,27332	27332,3851	31
13	Leather & allied products industries	1711,1712 1713,1719	1624,172 174,179	161,172 174,179	32-34
14	Primary textile & textile products industries	181-183 191-193 199	181-187 189,2391	183,193 197, 201 211-216 218, 221 223, 2292 2299, 2391	35-40
15	Clothing industries	243-245 249	175, 231 2392,243- 249	175, 231 2392,242- 249	41,42
16	Wood industries	251,252 254,256 258,259	251,252 254,256 258,259	251,252 254,256 258,259	43-47
17	Furniture & fixture industries	261,264 269	2619,264 266	2619,264 266	48-50
18	Paper & allied products industries	271-273 279	271,272 2731,2732 27331,274	271,272 2731,2732 27331,274	51-54
19	Printing, publishing & allied industries	281-284	286-289 8932	286-289 8932	55,56
20	Primary metal industries	291,292 294-297,299	291,292 294-298	291,292 294-298	57-63
21	Fabricated metal products industries	301-309	301-309	301-309	64-71
22	Machinery industries	311,312 319	311,315 316	311,315 316	72-74
23	Transportation equipment industries	321,323- 329	1652,188 321,323-329	2291,321 323-329 3852	75-81
24	Electrical & electronic products	331-339	268,318 3399,331- 336,338 3391	268,318 331,332 334-339	82-89
25	Non-Metallic mineral products industries	351,352 354-359	351,352 354-359	341,343 345,347 348,351- 357,359	90-95

Text table 2

Concordance between "M" level industry codes, standard industrial classification codes (SIC's) and link codes

M Level Industries - Manufacturing

M Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
26	Refined petroleum & coal products	361,369	365,369	365,369	96
27	Chemical & chemical products industries	371-377,379	372-379	371-379	97-103
28	Other manufacturing industries	391-393 397,399	391-393 397,399	219,381-384,393 395,397-399	104-108

Special Aggregations

Industry Title	S code
Business sector industries	1-13
Business sector - goods	1-6,9
Business sector - services	7-8,10-13
Business sector - excluding agricultural & related services	2-13

2 - Aggregation Parameters for Multifactor Productivity Measures

For the purpose of deriving multifactor productivity growth rates, the inputs in goods and services were taken from the input-output tables at their most disaggregated level[1] (about 600 commodities). However, it was not possible to use the inputs or outputs by industry at their most disaggregated level (154 industries for the business sector at the link level of the input-output tables) mainly because capital stock series were not available for some industries. Input-output tables have been aggregated to a special level of aggregation -- identified as PL -- required for the multifactor productivity measures which consists of 112 business sector industries. For analytical purposes, two other aggregation levels were built: 21 industries (level PM) for the manufacturing industries and 13 industries (level PS). These levels were determined to be as close as possible to the M and S levels of industry classification of the input-output tables. With the recent addition of two industries, aggregation level PM now coincides with aggregation level M for the manufacturing industries. It is hoped that further developments of the capital database will eventually allow multifactor productivity estimates to be produced at the M and S levels of the input-output tables and that these developments will extend the PL level closer to the L level.

1. *It was impossible, at this stage, to include a measure of natural resources such as land used as inputs. Natural resources are believed to be important mostly for primary industries but to play only a minor role in other industries.*

The industrial coverage of the business sector departs slightly from the current definition of the Canadian System of National Accounts as some components were excluded. These are Postal Services (industry L 131), Other Utility Industries nec (industry L 134), Government Royalties on Natural Resources (industry L 140), and Owner Occupied Dwellings (industry L 141). Owner Occupied Dwellings and Government Royalties on Natural Resources were considered to be improperly defined industries for productivity analysis while capital stock data were not available for the Postal Service Industry and Other Utility Industries.

Text tables 3 through 5 establish the concordance between the input-output L level and the multifactor productivity database PL, PM and PS levels of aggregation. The concordance for the PM level pertains only to manufacturing industries as industries outside this group are essentially the same as those at the PS level.

Text table 3

Concordance between the PL aggregation level and the link of aggregation of industries of input-output tables

PL Level Industries					
PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
1	Agricultural & related services industries	011-017 021-023	001-0021	001-0021	1
2	Fishing & trapping industries	031-033	041-047	041-047	2
3	Logging & forestry industries	0411,0412 0511	031,039	031,039	3
4	Metal mines	0611-0617 0619	051-052 057-059	051-059	4-6
5	Non-metal mines	0621,0622- 0625,0629 063	061,071- 073,079	061,071 073,077 079	7-10
6	Crude petroleum & natural gas	071	064	063-066	11
7	Quarrying, sand pits & mining serv.	081,082 091,092	083,087 096,098,099	083,087 092,099	12-13
8	Meat & poultry products	1011-1012	1011-1012	101,103	14-15
9	Fish products industry	102	102	111	16
10	Fruit and vegetables industries	103	103	112	17
11	Dairy products industries	104	104	105,107	18
12	Feed industry	1053	106	123	19
13	Misc. food products industries	106,109 1051-1052 1081-1083	105 1081-1083 1089	124,125 131,133 135,139	20,23,24
14	Biscuit, bread & other bakery products	1071-1072	1071,10721	128,1291	21,22
15	Beverage industries	111-114	1091-1094	141,143 145,147 151,153	25-28
16	Tobacco products industries	121,122	151,153	151,153	29
17	Rubber products industries	151-159	1623,1629	163,169	30
18	Footwear industries	1712	1624,174	161,174	33
19	Plastic products industries	161-169	1651,27332	27332,3851	31
20	Leather tanneries	1711	172	172	32
21	Misc. leather & allied prod. industries	1713,1719	179	179	34
22	Man-made fibre yarn & woven cloth	181,1829	181,183	183,201	35
23	Wool yarn & woven cloth industry	1821	182	193,197	36
24	Misc. textile products industries	191,193 1991-1995 1999	184,1851 1852,1871 1872,1891- 1894,1899	211-215 218	38-39
25	Carpet, mat & rug industry	192	186	216	40
26	Clothing industries exc. hosiery	243-245 2491-2493 2495,2499	175,2392 243-249	175,2392 242-249	41
27	Broad knitted fabric industry	183	2391	2391	37

Text table 3

Concordance between the PL aggregation level and the link of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
28	Hosiery industry	2494	231	231	42
29	Sawmills, planing & shingle mills	251	251	251	43
30	Veneer and plywood industries	252	252	252	44
31	Sash, door & other millwork ind.	254	254	254	45
32	Wooden box & coffin industries	256,258	256,258	256,258	46
33	Other wood industries	259	259	259	47
34	Household furniture industries	261	2619	2619	48
35	Office furniture industries	264	264	264	49
36	Other furniture & fixture ind.	269	269	266	50
37	Pulp & paper industries	271	271	271	51
38	Asphalt roofing industry	272	272	272	52
39	Paper box & bag industries	273	2731,2732 27331	2731,2732 27331	53
40	Other converted paper products ind.	279	274	274	54
41	Printing & publishing industries	281,283 284	286,288 289	286,288 289	55
42	Platemaking, typesetting & bindery	282	282	287,8932	56
43	Primary steel industries	291	291	291	57
44	Steel pipe & tube industry	292	292	292	58
45	Iron foundries	294	294	294	59
46	Non-ferrous smelting & refining ind.	295	295	295	60
47	Aluminum rolling casting, extruding	296	296	296	61
48	Copper rolling casting & extruding	297	297	297	62
49	Other metal rolling, casting etc.	299	299	298	63
50	Power boiler & struct. metal ind.	301,302	301,302	301,302	64
51	Ornamental & arch. metal prod. ind.	303	303	303	65
52	Stamped, pressed & coated metals	304	304	304	66
53	Wire and wire products industries	305	305	305	67
54	Hardware, tool & cutlery industries	306	306	306	68
55	Heating equipment industry	307	307	307	69
56	Machine shops industry	308	308	308	70
57	Other metal fabricating industries	309	309	309	71
58	Agriculture implement industry	311	311	311	72
59	Commercial refrigeration equipment	312	316	316	73
60	Other machinery & equipment ind.	319	315	315	74
61	Aircraft & aircraft parts industry	321	321	321	75

Text table 3

Concordance between the PL aggregation level and the link of aggregation of industries of input-output tables

PL Level Industries					
PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
62	Motor vehicle industry	323	323	323	76
63	Truck, bus body & trailer industry	324	324	324	77
64	Motor vehicle parts & accessories	325	1652,188 325	2291,325 3852	78
65	Railroad rolling stock industry	326	326	326	79
66	Shipbuilding and repair industry	327	327	327	80
67	Misc. transportation equipment ind.	328,329	328,329	328,329	81
68	Small electrical appliance industry	331	331	331	82
69	Major appliances (elec. & non-elec.)	332	332	332	83
70	Record players, radio & tv receiver	334	334	334	84
71	Electronic equipment industries	335	335	335	85
72	Office, store & business machines	336	318	318	86
73	Communications, energy wire & cable	338	338	338	87
74	Other elect. & electronic products	333,337 3391-3399	268,333,336 3391,3399	268,336- 337,339	88-89
75	Clay products industry	351	351	351	90
76	Cement industry	352	352	341	91
77	Concrete products industry	354	354	347	92
78	Ready-mix concrete industry	355	355	348	93
79	Glass & glass products industries	356	356	356	94
80	Non-metallic mineral products n.e.c.	357-359	353,357- 359	343,345 352-355 357,359	95
81	Refined petroleum & coal products	361,369	365,369	365,369	96
82	Industrial chemicals industries n.e.c.	371	371	378	97
83	Plastic & synthetic resin industry	373	373	373	98
84	Pharmaceutical & medicine industry	374	374	374	99
85	Paint & varnish industry	375	375	375	100
86	Soap & cleaning compounds industry	376	376	376	101
87	Toilet preparations industry	377	377	377	102
88	Chemical & chemical products n.e.c.	372,379	372,379	371-372,379	103
89	Jewellery & precious metal ind.	392	392	382	104
90	Sporting goods & toy industries	393	393	393	105
91	Sign and display industry	397	397	397	106
92	Other manufacturing industries n.e.c.	391,3991- 3994,3999	391,3991- 3994,3999	381,383 384,395 398,399	107-108

Text table 3

Concordance between the PL aggregation level and the link of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
93	Construction industries	401-409	404-421	404-421	109-117
94	Air transport & services incidental	451,452	501-502	501-502	118
95	Railway transport & rel. services	453	503	506	119
96	Water transport & rel. services	454,455	504,505	504,505	120
97	Truck and other transport ind.	456,4572- 4575,4589 4592,4599 996,9991	506-508 517,519	507-508 517,519	121,123 125
98	Urban transit system industry	4571	509	509	122
99	Highway & bridge maintenance ind.	4591	516	516	126
100	Pipeline transport industries	461	515	515	127
101	Storage & warehousing industries	471,479	524,527	524-527	128
102	Telecommunication broadcasting ind.	481	543	543	129
103	Telecommunication carriers & other	482,483	544,545	544,545	130
104	Electric power systems industry	491	572	572	132
105	Gas distribution systems industry	492	574	574	133
106	Wholesale trade industries	501-599	602-629	602-629	135
107	Retail trade industries	601-692	10722,2611 631-699	1292,2611 631-699	136
108	Finance, insurance & real est. ind.	701-705 709,711- 729,731- 733,741- 743,7499 7511,7512 759,761	7011-7016 7019,703 705-707 715,7211 7212,735 7371	702,704 7311,7312 735,7371	137-139
109	Services industries	771-777 779,911- 914,921 922,961 962,963- 969,971- 973,979 982,983 991-995 9999,4842 4581	841-845 849,851- 855,861- 864,866 867,869 871,872 874,876 877,879 881,886 891-8931 894-899 512	851,853- 859,861 862,864 866,869 871,872 874-879 891,8931 894-899 512	142-144 148-154 124
110	Educational service industries	851-859	801-809	801-809	145
111	Hospitals	861	821	821	146
112	Other health services	8621,863 865,866 8671,8679 868,8691- 8693,8699	822-827	823-827	147

Text table 4

Concordance between the PS aggregation level and the input-output link aggregation level

PS Level industries PS Codes	Industry Title	Link Code	PL Code
1	Agricultural & related services industries	1	1
2	Fishing & trapping industries	2	2
3	Logging & forestry industries	3	3
4	Mining, quarrying & oil well industries	4-13	4-7
5	Manufacturing industries	14-108	8-92
6	Construction industries	109-117	93
7	Transportation & storage industries	118-123,125-128	94-101
8	Telecommunication industries	129,130	102,103
9	Electric power & gas dist. industries	132,133	104,105
10	Wholesale trade industries	135	106
11	Retail trade industries	136	107
12	Finance, insurance & real estate industries	137-139	108
13	Community, business, personal services industries	124,142-154	109-112

Text table 5

Concordance between the PM aggregation level and the input-output link aggregation level

PM Level Manufacturing Industries PM Codes	Industry Title	Link Code	PL Code
5	Food industries	14-24	8-14
6	Beverage industries	25-28	15
7	Tobacco products industries	29	16
8	Rubber products industries	30	19
9	Plastic products industries	31	17
10	Leather & allied products industries	32-34	18,20,21
11	Primary textile & textile products industries	35-40	22-25,27
12	Clothing industries	41,42	26,28
13	Wood industries	43-47	29-33
14	Furniture & fixture industries	48-50	34-36
15	Paper & allied products industries	51-54	37-40
16	Printing, publishing & allied industries	55,56	41-42
17	Primary metal industries	57-63	43-49
18	Fabricated metal products industries	64-71	50-57
19	Machinery industries	72-74	58-60
20	Transportation equipment industries	75-81	61-67
21	Electrical & electronic products	82-89	68-74
22	Non-metallic mineral products industries	90-95	75-80
23	Refined petroleum & coal products	96	81
24	Chemical & chemical products industries	97-103	82-88
25	Other Manufacturing industries	104-108	89-92

APPENDIX 4

Quality Rating of Productivity Estimates and Related Data

This appendix provides quality ratings of labour productivity and related data and of multifactor productivity data, including the ratings of the input and output components used to estimate these measures. Quality ratings are provided for the last benchmark year as noted on the following tables. Data quality ratings for previous years may be found in preceding issues of this publication; data for the period following the benchmark year are deemed to be of lesser quality although no quality rating is provided.

1 - Quality Rating of Labour Productivity Estimates and Related Data

Like other components of the Canadian System of National Accounts (CSNA), the labour productivity and related data presented in this publication are derived from a variety of sources and subjected to various adjustments. Assessing the quality of the data thus raises difficulties similar to those pointed out in other CSNA publications. The labour productivity and related data presented in this publication are derived from:

(1) input-output tables, and real gross domestic product by industry, and,

(2) various surveys and censuses containing information on employment, hours worked, and labour income.

In rating various data our main interest lies more in year-to-year changes than in the levels of various constructs. No attempt will be made to establish a cardinal rating of there constructs used in productivity. However, based on an informed opinion, an ordinal rating will be attempted. The rank of 1 means most reliable, the rank of 2 means reliable and the rank of 3 means acceptable. Ratings are provided for the following series:

(i) Real GDP at factor cost;
(ii) Persons at work;
(iii) Person-hours worked;
(iv) Labour compensation;
(v) Real GDP per person at work;
(vi) Real GDP per person-hour;
(vii) Compensation per person at work;
(viii) Compensation per person-hour;
(ix) Unit labour cost.

Real GDP. The quality ratings of real GDP have been taken from Appendix A of the publication: *The Input-Output Structure of the Canadian Economy, 1990* (Catalogue 15-201).

Persons at work. For these data, the rankings have been determined as follows: in general, a rank of 1 has been assigned to the most reliable estimates that are based completely on

censuses[1], surveys or administrative records with minimum adjustments for coverage, valuation and classification. A rank of 2 has been assigned to less reliable census and survey data with adjustments for coverage. A rank of 3 has been assigned to all other sources, for example, household surveys (*Labour Force Survey*), and decennial censuses, unless experience indicates otherwise. The main reason that household surveys or decennial censuses have been given this ranking is a lack of response precision in household surveys or population censuses to questions related to industrial classification as compared to establishment-based censuses or surveys. However, the quality rating of series taken from sample surveys, like the *Labour Force Survey*, also depends on the size of the sample. Aggregate series may, therefore, have higher ratings than disaggregated series. Likewise, at a given level of aggregation, large industries may have a better quality rating than small industries.

According to these criteria, the employment data from the Annual Survey of Manufactures at the S level of aggregation in 1990 carry a ranking of 2. The reason it has been assigned a ranking of 2 and not 1 is because in the revised data for 1990, 16.6% of the paid workers data are taken from administrative data and the small forms. Out of that percentage, 11.6% are estimated from administrative data where employment is not reported (data on wages and salaries are used to estimate the number of paid workers in this portion of the universe). For 1990, the following criteria has been used for ranking the employment data for various industries at M level of aggregation in Manufacturing. A ranking of 1 has been assigned where less than 10.0% of the employment data are taken from administrative data. A ranking of 2 has been assigned to data where more than 10.0% but less than 20.0% of the data is from this source. A ranking of 3 has been assigned above 20.0%.

The employment data for the agriculture industry are taken from the Labour Force Survey, which is a household survey. For this industry, it is the only source of employment estimates. Also, in the agriculture industry, 61.7% of the workers are "other-than-paid" where the quality of data is expected to be slightly lower than for "paid workers". The employment data for the agriculture industry, therefore, has been assigned a ranking of 3. For the remaining industries in the business sector of the economy, the employment data for paid workers originates from either establishment-based surveys (*Estimates of employees* up to 1982 and *Survey of Employment, Payroll and Hours* from 1983 onwards) or from a variety of other surveys. The employment data for the other-than-paid workers is obtained from the *Labour Force Survey*. Therefore, in the case of all remaining industries for which productivity and unit labour cost data are published at the S level of aggregation, the quality rating of the employment data is determined as follows. A ranking of 1 has been assigned to the industry where up to 10.0% of the persons at work are other-than-paid. For industries where this ratio is between 10.0% and 20.0%, the ranking is 2. For industries where this ratio is greater than 20.0%, the ranking of 3 has been assigned to the employment data. However, at the aggregate business sector level, errors tend to cancel out and it is felt that a quality rating of 1 could be attributed to the data.

Person-hours worked. The number of person-hours worked in each industry except manufacturing is obtained as the product of the number of person at work and the average number of hours worked in each year. Average hours data from the *Labour Force Survey* are good quality data and, where comparisons are possible e.g. in manufacturing, average hours from both sources show very similar year-to-year changes. As a separate construct, the average hours worked data have a quality rating of 2. The quality rating of person-hours is the rounded average of the number of persons at work and the average number of hours worked. In

1. See Appendix 2 for a full description of data sources.

manufacturing, person-hours worked data come from the Annual Survey of Manufactures where distinct calculations are made for production workers and for salaried employees, total person-hours worked being obtained as the sum of two elements. However, even for production workers, the person-hours worked are mostly estimated from person-hours paid. For salaried employees, it is derived using average standard work week and vacation weeks paid. Since the hours worked data at the S level of aggregation in manufacturing are simply a sum of the hours worked data at the M level of aggregation (there being no compensating errors) the quality rating of person-hours worked data at both S and M level of aggregation has been set at 2. Aggregate business sector hours have been attributed a rating of 1 because of compensating errors.

Labour compensation. Labour compensation is the sum of labour income of paid workers and the imputed labour income of self-employed workers. Since the estimates of labour income in the benchmark year come from administrative data and have been subjected to various Input-Output adjustments, these have a rating of one. However, in some industries (for example Agriculture, Construction, Retail Trade) there is a large number of self-employed workers for whom there is no direct measure of labour income and an imputation is made on the assumption that the hourly compensation of self-employed workers equals that of paid workers. Therefore, at aggregation level S the following rating criteria has been used. For industries, where the ratio of self-employed workers to persons at work is less than 10.0% the rating of labour compensation data is 1, where this ratio is 10.0% and 20.0% the rating is 2. For a ratio greater than 20.0% a rating of 3 has been assigned. According to these criteria, compensation data for all manufacturing industries at M level of aggregation have been assigned a quality rating of 1.

Labour productivity and *related data*. The quality ratings of ratios like real GDP per person at work, real GDP per person-hour and unit labour cost have been calculated as the rounded weighted average of the ratings for the two variables. For example, if the rating for real GDP is 1, and employment is 2, then the rating for real GDP per person at work is 2.

Text table 1

Quality ratings of labour productivity and related data at aggregation level S and business sector, 1990

Industry title	Real GDP	Persons at work	Person-hours	Labour compensation	Real GDP per person	Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
Agricultural & related services industries	2	3	3	3	3	3	3	3	3
Manufacturing industries	1	2	2	1	2	2	2	2	1
Construction industries	3	2	2	2	3	3	2	2	3
Transportation & storage industries	2	2	2	2	2	2	2	2	2
Communication industries	2	1	2	1	2	2	1	2	2
Wholesale trade industries	3	1	2	1	2	3	1	2	2
Retail trade industries	3	2	2	2	3	3	2	2	3
Community, business, personal services industries	2	2	2	2	2	2	2	2	2
Business sector industries	1	1	1	2	1	1	2	2	2

Text table 2

Quality ratings of labour productivity and related data for manufacturing industries at aggregation level M, 1990

Industry title	Real GDP	Persons at work	Person-hours	Labour compensation	Real GDP per person	Real GDP per person-hour	Compensation per person	Compensation per person-hour	Unit labour cost
Food industries	1	1	2	1	1	2	1	2	1
Beverage industries	2	1	2	1	2	2	1	2	2
Tobacco products industries	2	1	2	1	2	2	1	2	2
Rubber products industries	1	1	2	1	1	2	1	2	1
Plastic products industries	1	2	2	1	2	2	2	2	1
Leather & allied products ind.	1	1	2	1	1	2	1	2	1
Primary textile & textile products industries	1	2	2	1	2	2	2	2	1
Clothing industries	1	1	2	1	1	2	1	2	1
Wood industries	2	2	2	1	2	2	2	2	2
Furniture & fixture industries	1	3	2	1	2	2	2	2	1
Paper & allied products ind.	1	1	2	1	1	2	1	2	1
Printing, publishing & allied ind.	2	2	2	1	2	2	2	2	2
Primary metal industries	1	1	2	1	1	2	1	2	1
Fabricated metal products ind.	1	3	2	1	2	2	2	2	1
Machinery industries	1	2	2	1	2	2	2	2	1
Transportation equipment ind.	2	1	2	1	2	2	1	2	2
Electrical & electronic products industries	2	2	2	1	2	2	2	2	2
Non-metallic mineral products industries	1	2	2	1	2	2	2	2	1
Refined petroleum & coal products industries	2	1	2	1	2	2	1	2	2
Chemical & chemical products industries	2	1	2	1	2	2	1	2	2
Other manufacturing industries	2	3	2	1	3	2	2	2	2

2 - Quality Rating of Multifactor Productivity Estimates and Related Data

The quality rating for multifactor productivity at all levels of aggregation relies on the quality rating for gross output, intermediate inputs, capital, and labour, except for that of the business sector which depends on the quality rating for value-added, for capital, and for labour.

Intermediate inputs and gross output in current and constant prices and gross domestic product (GDP) carry the quality ratings described in Appendix A of *The Input-Output Structure of the Canadian Economy*, catalogue number 15-201. Capital input data quality is based on the ratings of business investment as given in the above mentioned publication. The quality ratings of employment, person-hours and labour compensation are discussed in section 1 of this appendix.

The quality ratings of basic data at the PS and PM aggregation levels (refer to Appendix 3 for more information on aggregation levels) are obtained by weighting the disaggregated quality ratings using value shares as weights. The quality assessment of multifactor productivity estimates is then based on the combined quality ratings of outputs, labour inputs, capital inputs, and, if applicable, intermediate inputs, according to their respective value shares. Quality ratings

of basic data shown in text tables 3 and 4 of this appendix are rounded to the nearest highest rating to account for the quality-increasing effect of aggregation.

Text table 3

Quality ratings for the components of multifactor productivity estimates by industry at aggregation level PS and for the total business sector, 1990

Industry Title	Gross Output		Labour Inputs			Capital Inputs		Intermediate Inputs		GDP		MFP Index	
	C$	K$	C$	Pers.*	Pers.-Hrs**	C$	K$	C$	K$	C$	K$	Pers.*	Pers.-Hrs.**
Agricultural & related services ind.	2	2	3	3	3	2	2	2	2	2	2	2	2
Manufacturing industries	1	1	1	2	2	1	2	1	1	1	1	1	1
Construction industries	1	3	2	2	2	2	3	3	3	3	3	3	3
Transportation & storage ind.	1	1	2	2	2	1	2	2	2	2	2	2	2
Telecommunication industries	1	1	1	1	2	2	2	2	2	1	2	2	2
Wholesale trade industries	1	2	1	1	2	2	2	3	3	3	3	3	3
Retail trade industries	1	2	2	2	2	2	2	3	3	3	3	3	3
Business sector industries	...	...	2	1	1	1	2	...	...	1	1	1	1

* Persons at work ** Person-hours worked

Text table 4

Quality ratings for the components of multifactor productivity estimates by manufacturing industry at aggregation level PM, 1990

Industry Title	Gross Output		Labour Inputs			Capital Inputs		Intermediate Inputs		MFP Index	
	C$	K$	C$	Pers.*	Pers.-Hrs**	C$	K$	C$	K$	Pers.*	Pers.-Hrs.**
Food industries	1	1	1	1	2	1	2	1	1	1	2
Beverage industries	1	1	1	1	2	1	2	2	2	1	2
Tobacco products industries	1	1	1	1	2	1	2	2	2	1	1
Rubber products industries	1	1	1	1	2	1	2	1	1	1	1
Plastic products industries	1	1	1	2	2	1	2	1	1	1	1
Leather & allied products industries	1	1	1	1	2	1	2	1	1	1	1
Primary textile & textile products ind.	1	1	1	2	2	1	2	1	1	1	1
Clothing industries	1	1	1	1	2	1	2	1	1	1	1
Wood industries	1	1	1	2	2	1	2	1	1	2	2
Furniture & fixture industries	1	1	1	3	2	1	2	1	1	1	1
Paper & allied products industries	1	1	1	1	2	1	2	1	1	1	1
Printing, publishing & allied industries	1	2	1	2	2	1	2	2	2	2	2
Primary metal industries	1	1	1	1	2	1	3	1	1	1	1
Fabricated metal products industries	1	1	1	3	2	1	3	1	1	1	1
Machinery industries	1	1	1	2	2	1	3	1	1	1	1
Transportation equipment industries	1	1	1	1	2	1	2	2	2	2	2
Electrical & electronic products ind.	1	2	1	2	2	1	2	1	1	2	2
Non-metallic mineral products ind.	1	1	1	2	2	1	2	1	1	1	1
Refined petroleum & coal products ind.	1	1	1	1	2	1	3	2	2	2	2
Chemical & chemical products ind.	1	1	1	1	2	1	3	2	2	2	2
Other manufacturing industries	1	1	1	3	2	1	2	2	2	2	2

* Persons at work ** Person-hours worked

APPENDIX 5

Productivity and Related Data in CANSIM

Multifactor Productivity — ***Indices since 1961***	CANSIM Matrices
Gross output productivity based on hours worked	7896
Net-gross output productivity based on hours worked	7897
Value-added productivity based on hours worked	7898
Interindustry productivity based on hours worked	7899
Gross output productivity based on employment	7900
Net-gross output productivity based on employment	7901
Value-added productivity based on employment	7902
Interindustry productivity based on employment	7903
Labour Productivity — ***Indices since 1946***	
Persons at work	7922
Paid workers	7923
Person-hours worked of persons at work	7924
Person-hours worked of paid workers	7925
Real GDP per person at work	7926
Real GDP per person-hour worked of persons at work	7927
Labour compensation of persons at work	7934
Labour compensation per person at work	7935
Labour compensation per person-hour worked of persons at work	7936
Unit labour cost	7937
Real GDP	7938
Absolute values since 1961	
Number of persons at work	7916
Number of paid workers	7917
Number of person-hours worked of persons at work	7918
Number of person-hours worked of paid workers	7919
Real GDP per person at work	7920
Real GDP per person-hour worked of persons at work	7921
Average hours worked per week of persons at work	7928
Average hours worked per week of paid workers	7929
Labour compensation of persons at work	7930
Labour compensation per person at work	7931
Labour compensation per person-hour worked of persons at work	7932
Unit labour cost	7933

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System of National Accounts

Aggregate Productivity Measures

1993

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Contributors

This publication was produced under the direction of Claude Simard, Director and René Durand, Assistant Director, Input-Output Division.

Tables, Graphs and Composition: N. Richer, S. Zoschke

Data Analysis and Development and Processing: S. Burrows, B. Fortin, J.-P. Maynard, M. Mirotchie, A. Picard, J. Thorsteinson, S. Zoschke

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The System of National Accounts

In Canada, the National Accounts have been developed since the close of the Second World War in a series of publications relating to their constituent parts. These have now reached a stage of evolution where they can be termed a "System of National Accounts". For purposes of identification, all publications (containing tables of statistics, descriptions of conceptual frameworks and descriptions of sources and methods) which make up this System carry the term "System of National Accounts" as a general title.

The System of National Accounts in Canada consists of several parts. The annual and quarterly Income and Expenditure Accounts (included with Catalogue Nos. carrying the prefix 13) were, historically speaking, the first set of statistics to be referred to with the title "National Accounts" (National Accounts, Income and Expenditure). The Balance of International Payments data (Catalogue Nos. with prefix 67), are also part of the System of National Accounts and they, in fact, pre-date the Income and Expenditure Accounts.

Greatly expanded structural detail on industries and on goods and services is portrayed in the Input-Output Tables of the System (Catalogue Nos. with prefix 15). The Catalogue Nos. carrying the prefix 15 also provide measures of the contribution of each industry to total Gross Domestic Product at factor cost as well as Productivity Measures.

Both the Input-Output tables and estimates of Gross Domestic Product by industry use the establishment as the primary unit of industrial production. Measures of financial transactions are provided by the Financial Flow Accounts (Catalogue Nos. with prefix 13). Types of lenders and financial instruments are the primary detail in these statistics and the legal entity is the main unit of classification of transactors. Balance sheets of outstanding assets and liabilities are published annually.

The System of National Accounts provides an overall conceptually integrated framework in which the various parts can be considered as interrelated sub-systems. At present, direct comparisons amongst those parts which use the establishment as the basic unit and those which use the legal entity can be carried out only at highly aggregated levels of data. However, Statistics Canada is continuing research on enterprise-company-establishment relationships; it may eventually be feasible to reclassify the data which are on one basis (say the establishment basis) to correspond to the units employed on another (the company or the enterprise basis).

In its broad outline, the Canadian System of National Accounts bears a close relationship to the international standard as described in the United Nations publication: A System of National Accounts (Studies in Methods, Series F, No. 2 Rev. 3, Statistical Office, Department of Economic and Social Affairs, United Nations, New York, 1968).

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PART 2

Indices of labour productivity and unit labour cost

APPENDIXES

Introduction

As for previous issues, this issue of *Aggregate Productivity Measures* introduces a number of changes to the presentation of the estimates. Multifactor productivity indices are now presented with additional related indicators in order to provide our users with a more comprehensive accounting of industrial growth.

At the aggregate business sector level, a full decomposition of growth is now presented. The growth of each category of inputs, namely capital and labour, is presented with its associated weight - its cost share - and in weighted form. The sum of the weighted rates of growth of the input categories account for the incidence of all identifiable purchased factors of production on business sector's output growth. The residual output growth is accounted for by multifactor productivity.

At the industry level, productivity indices on gross output are now presented with the associated partial productivity indices on five input classes: capital, labour, energy, material and services. The indices of multifactor productivity on net-gross output- gross output net of intra industry sales - and the interindustry indices are also presented in the same table with a new index of total unit cost. Full growth decomposition for each class of multifactor productivity indices is not presented at the industry level as it would require too much space.

The new index of total unit cost is the natural counterpart of the unit labour cost with which the reader is more familiar and which appears, as usual, in the labour productivity tables. The unit labour cost is equal to labour compensation divided by the output of goods and services produced. The total unit cost is equal to the income of all inputs - capital, labour, energy, materials and purchased services - divided by the output of goods and services produced. It is based on factor income as observed and which thus include short run fluctuations in profits associated mainly with fluctuations in demand and capacity utilization rates.

The total unit costs are equal, by definition, to the gross output unit prices of the industries or, more simply, to their selling prices. Total unit costs are, therefore, more immediate indicators of the competitiveness of Canadian industries than their unit labour costs which account for only one of the five input categories listed above. However, these indices are still of limited analytical use since they are not presently compared with other countries' total unit cost for similar products and measured in the same currency. Ideally, one would like to compare, on a product by product basis, *purchasing power parities* between Canada and its major trading partners. Purchasing power parities provide ideal indices for international comparison because they compare purchasing price *levels* in same currency for similar products in many countries.

The growth in total unit cost can be expressed as the growth in average input prices minus the growth in total factor productivity. In other words, total factor productivity measures the inflation in input prices which is absorbed by efficiency gains and which does not translate itself into inflation in output prices. Seen from another angle, the difference between the growth of input prices and the growth in output prices can be seen as the real income gains accruing to inputs and originating from efficiency gains.

Since most inputs are themselves the output of the production system, their real price did not change dramatically over time although some relative price changes can be read from the tables. However, labour inputs are not produced and their real prices generally increased steadily over time. In other words, the bulk of productivity gains accrued to labour. This induced an observed substitution of other inputs to labour. Inputs which have been submitted to important international price shocks such as energy inputs, have also exhibited important relative price changes in the past.

Multifactor productivity, labour productivity and related data now incorporate revisions due to the completion of 1990 final and 1991 preliminary input-output benchmark tables, as well as consequent revisions to 1990-1993 compensation and real GDP data. The multifactor productivity estimates now include 111 business sector industries. Two of the previous 112 industries were aggregated together for reasons of confidentiality. The KLEMS database introduced in the previous issue of this publication has also been updated and is now available to users[1].

Canada participates with the United-States and Mexico to joint seminars on productivity measurement. These seminars aim at informing each trading partner of NAFTA on the sources, concepts and methods used in the respective country for measuring productivity. These seminars are held in order to harmonize the production of statistics and increase the comparability of the indices produced by each country overtime. Productivity indicators being the major ingredients in any analysis of competitiveness, these efforts should help analysts in their appraisal of the relative performance of the trading partners.

At the last joint seminar, it was suggested to adopt cost weighted measures of inputs for both multifactor and all partial productivity estimates. This implies that labour productivity estimates could appear, in the future, as partial labour productivity estimates in the multifactor productivity tables. This also implies that the traditional labour productivity estimates published in this catalogue for years could be abandoned.

It was also agreed, at that same seminar, that hours worked constitute a better measure of labour input than employment figures. Therefore, only estimates based on hours worked will be presented from now on for both labour and multifactor productivity indices. This will introduce a simplification in the presentation of the results and avoid possible confusion for the users. The related description contained in the technical appendices to this publication have been modified accordingly.

This issue already introduces the partial labour productivity indices based on gross output together with the other input partial productivity estimates as indicated above. These partial productivity indices differ from the traditional labour productivity estimates not only because the hours are weighted by the wage rates but also because they are based on gross output rather than real value-added. Partial labour productivity indices based on real value-added will be introduced in the future.

1. See Johnson, J., "A KLEMS Database: Describing the Input Structure of Canadian Industry", *Aggregate Productivity Measures*, catalogue 15-204E, April 1994, pp. 19-32.

FOR FURTHER READING
Selected publications from Statistics Canada

The labour and multifactor productivity indexes presented in this publication are obtained mainly from a set of integrated industry and commodity statistics within the System of National Accounts (SNA). The integration ensures consistency of definition over time and across industry and commodity classifications and the information may therefore differ from other Statistics Canada data. Publications with a catalogue number prefix 15 contain SNA integrated data and are available under the following titles:

- Gross Domestic Product by Industry, cat. 15-001.
- The Input-Output Structure of the Canadian Economy, cat. 15-201.
- The Input-Output Structure of the Canadian Economy in Constant Prices, cat. 15-202.
- The Input-Output Structure of the Canadian Economy, 1961-81, cat. 15-510, occasional.
- The Input-Output Structure of the Canadian Economy in Constant Prices, 1961-81, cat. 15-511, occasional.

Highlights

In Brief

- Unit labour cost of Canadian businesses declined 0.3% in 1993, the first drop since 1962. This relative price improvement, combined with the depreciation of the Canadian dollar, contributed to a strong increase in Canadian exports.
- Canadian productivity increased in 1993, but is still lower than the 1987 peak, and below the growth rates experienced by the U.S.. This had a negative impact on the Canadian standard of living in terms of both real income and leisure time.
- A comparison of 15 individual manufacturing industries reveals that Canadian MFP has been declining since 1985, while U.S. productivity has continued to increase along its' historical path. The strongest growth in the U.S. was found in the Machinery, Electrical and Electronic products industry, which is much less important in the Canadian manufacturing sector.

1.1 - Multifactor Productivity Increases Slowly

The revised estimates of multifactor productivity[1] of Canadian businesses increased 0.9% in 1993, continuing the recovery that started in 1992. However, compared with the recovery after the 1982 recession, the present productivity growth appears quite anemic. Multifactor productivity increased considerably in 1983 and 1984, followed by a period of slower growth. Productivity reached a peak in 1987 and began to decline during the late 1980's, a process that accelerated during the last recession. Despite the positive productivity gains of the last two years, the index in 1993 was still 4.3% lower than the 1987 peak.

Productivity growth has a direct impact on the standard of living as measured by GDP per capita. During the 1960's and up to the mid 1970's strong increases in productivity contributed significantly to the improvement in the Canadian standard of living. After the mid 1970's, growth in Canadian productivity and GDP per capita has slowed down considerably. In 1993, real GDP per capita was at the same level as 1987 after dropping 5.4% between 1989 and 1992.

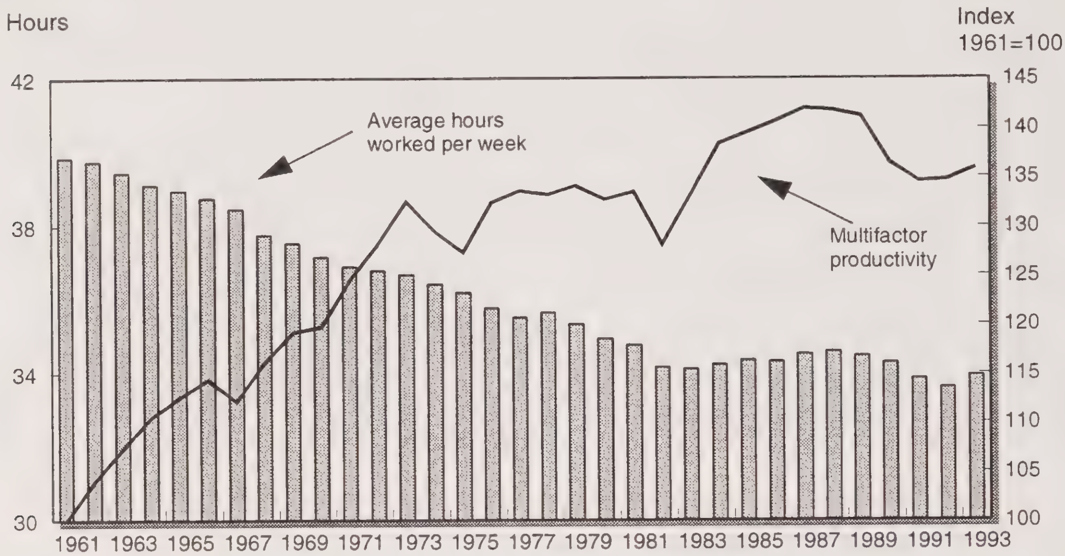
Productivity gains also contribute to the Canadian standard of living by having a positive impact on the number of leisure hours. During the 1960s and up to the mid 70s, strong productivity gains have led to a significant reduction in the average number of hours worked up to the beginning of the 1980's. Following this period, the average number of hours worked remained practically

1. Multifactor productivity measures are based upon the value-added concept unless otherwise stated. U.S. MFP measures are based upon the concept of net-gross output, and in order to make comparisons between Canada and the U.S. the Canadian measures must be recalculated based upon net-gross output.

unchanged while productivity growth was slower. It seems that Canadian workers compromised their leisure time to try to maintain their standard of living.

Figure 1

The average number of hours worked per week has remained stable during the 1980's, following slower growth in productivity gains



1.2 - The Increase in Labour Input was the Primary Source of the Growth in Real GDP in 1993...

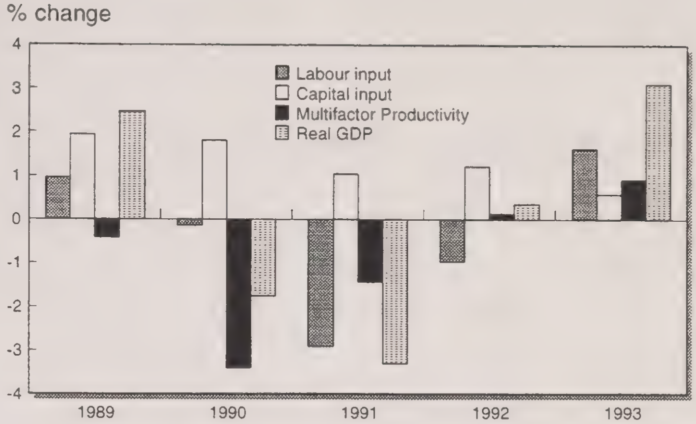
The 3.1% increase in business sector real GDP in 1993 can be attributed more than half to labour input while multifactor productivity accounted for less than one third of the growth. However, if the business sectors are separated into the goods producing industries and the services, we notice a significant difference between the utilization of labour inputs.

In the goods-producing sector, the demand recovery has induced businesses to increase labour factor utilization by extending work hours rather than by hiring new or previously laid-off employees. This decision could be partly explained by higher hiring costs in the goods-producing industries and the relatively weak recovery from the recession. One will recall the major reduction in employment that the goods producing sector underwent during the 1990-1992 recession. In 1993, the level of employment in this sector was still 11% below the peak observed in 1989.

Services-producing industries, on the other hand, also registered an increase in the number of hours worked in 1993, mostly due to an increase in the level of employment. Output per hour worked was up in all the service industries except for community, business and personal services where it decreased 4.0%. The decline was partly due to a 14.7% cyclical upswing in the number of independent workers. This new wave of individuals going into business for themselves seems to have had a negative impact on the productivity of this sector in 1993.

Figure 2

Labour input represents the largest share of output growth in 1993



1.3 - ... While Capital Contribution Decreases

The capital contribution to output growth fell from 1.2% in 1992 to 0.6% in 1993, following the same pattern experienced after the 1982 recession. While the fluctuations in hours worked are synchronized with those of real GDP, the cyclical movement of the capital stock exhibits a certain rigidity, and tends to adjust more slowly. Since investment decisions are made with a long run perspective, capital stock continues to grow during the initial period of a recession and does not tend to adjust downwards until the later portion of a recession. As a result, businesses must adjust capacity utilization to short run changes in demand.

1.4 - Canadian Manufacturers have Improved their Multifactor Productivity

As with the business sector, multifactor productivity of Canadian manufacturing industries increased for a second consecutive year in 1993. The primary source of 4.8% growth in real GDP was multifactor productivity which increased 3.2%. The contribution of the number of hours worked increased 1.8% while the contribution of the capital stock slightly decreased (-0.3%). However, these productivity gains are significantly lower than what was observed after the 1982 recession.

Over the last decade, Canadian manufacturers have modernized their equipment to remain internationally competitive. This was the first time since the 1950's that net investment

Figure 3

Canadian manufacturer's net investment in machinery are at the highest level since 1950

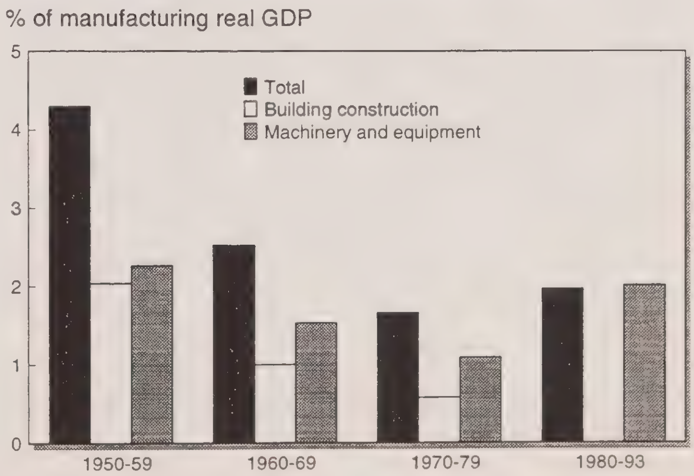
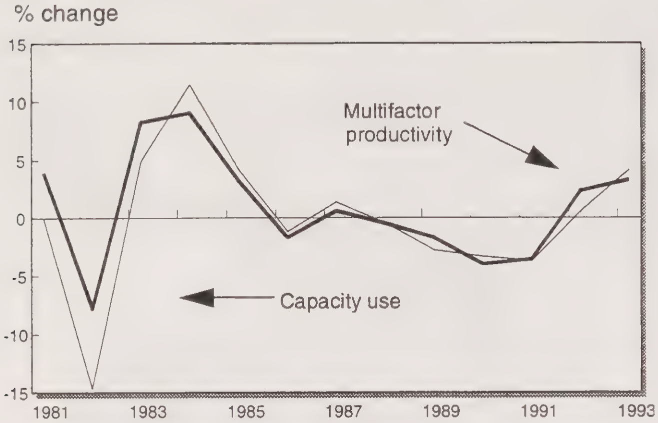


Figure 4

Underuse of manufacturing capacity has a negative impact on productivity



spending in machinery and equipment represented such a large share of real GDP. However, this modernization effort has resulted in excess manufacturing capacity due to the slowdown in demand observed at the end of the 1980's, which has caused a negative impact on measured productivity. In 1993, the capacity utilization rate of manufacturers stood at 78.3%, slightly below the historical average and 5.8% below the peak in 1987. The increase in the output, combined with the lag in investment spending, will help to boost the capacity utilization rate of manufacturers and improve multifactor productivity in 1994. In fact, preliminary estimates indicate that manufacturing capacity utilization was 82.9% in the 3rd quarter of 1994.

1.5 - Total Unit Cost Remained Virtually Unchanged in 1993

Total unit cost increased by just 0.3% in 1993, which is good news for the Canadian business sector. This marginal rise is due to an increase in the capital cost (which represents only 27.3% of total unit cost), which is mostly outweighed by a decrease in unit labour cost, the main component of total unit cost.

The 0.3% drop in unit labour cost, the first observed since 1962, is mainly explained by the slight increase in hourly compensation (0.7%). If the growth in real GDP per hour (0.9%) had been stronger the unit labour cost would have declined further[2]. Despite the moderate growth in the Canadian economy in 1993, labour market conditions remained difficult since little progress was made in reducing the unemployment rate. The excess supply of labour has resulted in mild salary inflation, which in turn has contributed to the superior cost performance of Canadian businesses.

It is not possible to discuss Canadian economic performance in terms of productivity and unit costs unless we compare our performance to the United States, our largest trading partner. During the 1980's our trading relationship with the Americans has become even more important as our exports to the U.S. now represent almost 80% of our total exports. The following sections will attempt to compare our productivity performance with that of the U.S. for the business sector and 15 manufacturing industries.

2. The reader will recall that growth in unit labour cost is approximately equal to growth in labour compensation less the growth in real GDP per hour.

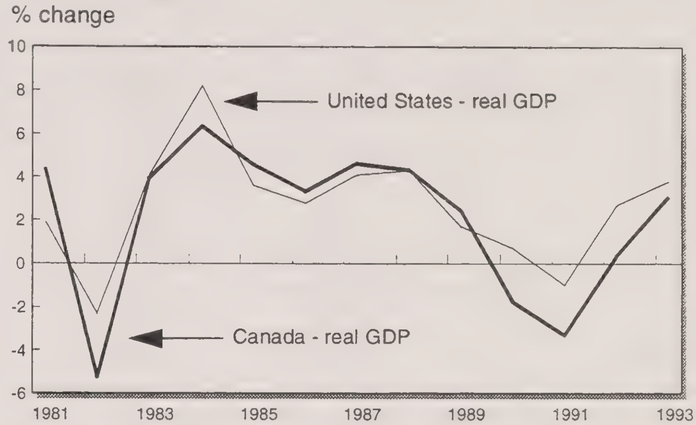
2.1 - Productivity Comparisons Between Canada and the United States[3] Reveal Mixed Blessings for the Canadian Business Sector

Canadian aggregate productivity measures reveal both good news and bad news regarding the international competitiveness of the Canadian economy. Fortunately for Canadian exporters, the devaluation of the Canadian dollar and weak salary inflation has allowed exports to increase inspite of poor productivity growth.

Regardless of which measure you examine, labour productivity or multifactor productivity, the overall Canadian business sector realised weaker growth rates compared to its' U.S. counterpart. Labour productivity in Canada grew by 0.9% in 1993 compared to 1.8% in the United States. In 1992, which is the latest year for which U.S. data is available, multifactor productivity in the U.S. grew more quickly than in Canada, 1.9% compared to 0.1%.

Figure 5

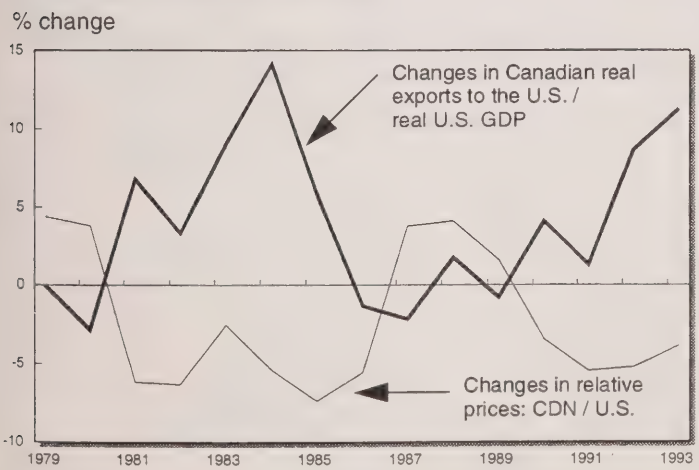
The recession was more severe in the Canadian business sector



The bright spots in Canada's competitive position are found in our hourly compensation and unit labour costs. Hourly compensation in the Canadian business sector grew by just 0.7% in 1993, compared to U.S. wages which grew by 3.8%. This low Canadian salary increase is consistent with our weak productivity growth. The combination of low wage increases and low productivity improvement resulted in a decrease of 0.3% in unit labour costs for the Canadian business sector, the first drop since 1962. It should be noted that had productivity growth been greater, the drop in unit labour cost would also have been greater. U.S. unit labour costs on the other hand continued to grow at 2.0% in 1993.

Figure 6

Canadian exports to the U.S. are sensitive to changes in relative prices



The picture for the Canadian business sector looks even better if unit labour costs are corrected for the exchange rate. Canadian unit labour costs measured in U.S. dollars actually fell by 6.6% in 1993. U.S. unit labour costs continued to increase in 1993, which has resulted in a gap of 8.6% between the

3. Productivity and related data from the United States used in this publication were released by the U.S. Bureau of Labor Statistics.

Canadian and U.S. business sector. This gap, combined with the strong U.S. recovery, played an important role in the recent surge of Canadian exports to the U.S., which increased from 2.4% of U.S. GDP in 1991 to 2.9% in 1993. Since manufactured goods represent slightly more than 70% of all exports of goods and services to the United States, it is of particular interest to examine the manufacturing industries in each country in more detail.

Table 1

Growth rates of business sector productivity measures for Canada and the United States

Year	Labour productivity		Labour compensation		Unit labour cost		Canadian unit labour cost in U.S. $
	Canada	U.S.	Canada	U.S.	Canada	U.S.	
1981	2.1	1.3	13.0	9.4	10.6	8.0	7.8
1982	-0.8	0.1	10.0	7.5	11.0	7.4	7.8
1983	4.1	2.3	4.9	3.8	0.8	1.5	0.9
1984	3.5	2.4	5.1	4.3	1.5	1.9	-3.4
1985	0.5	1.4	3.7	4.5	3.2	3.0	-2.1
1986	1.5	2.1	4.8	5.0	3.2	2.8	1.4
1987	1.1	1.0	5.8	3.5	4.8	2.6	9.8
1988	0.8	1.0	6.3	4.4	5.4	3.3	13.6
1989	0.9	-0.7	6.7	3.5	5.7	4.3	9.9
1990	-1.5	0.7	4.1	5.7	5.8	5.0	7.3
1991	1.1	1.0	5.1	4.8	4.3	3.8	6.2
1992	1.7	3.3	3.7	5.1	1.4	1.7	-3.8
1993	0.9	1.8	0.7	3.8	-0.3	2.0	-6.6

2.2 - Manufacturing Industries Witness a Similar Experience

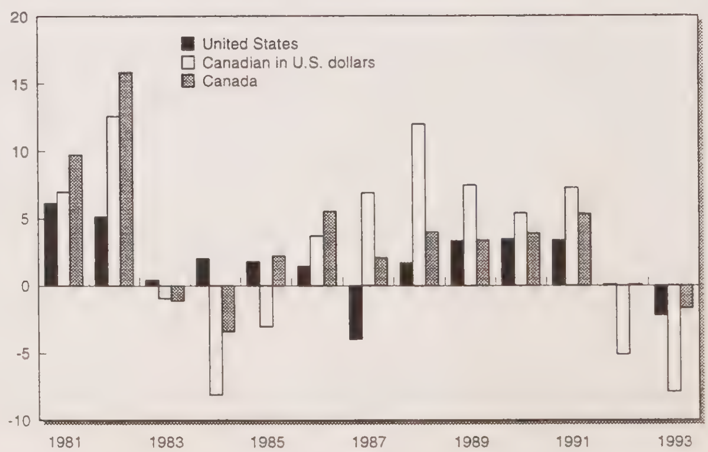
Aggregate measures of productivity in the Canadian manufacturing sector compared to the U.S. also provide mixed messages about Canada's competitive position. On the positive side, Canadian manufacturing wages only increased by 0.5% compared to U.S. wages which rose by 2.8% in 1993. On the negative side, Canadian labour productivity, grew about half as quickly as U.S. productivity. The end result is a fall in unit labour costs for both countries, but a relatively better performance for U.S. manufacturers.

As in the case for the aggregate business sector, if unit labour costs are corrected for the exchange rate then

Figure 7

The devaluation of the dollar boosts the competitiveness of Canadian manufacturers

% change in unit labour costs



the picture becomes much improved for Canadian manufacturers. Canadian unit labour costs measured in U.S. dollars fell by 7.9% in 1993, while it declined by 2.2% for their U.S. competitors.

Table 2

Growth rates of manufacturing industries productivity measures for Canada and the United States

Year	Labour productivity		Labour compensation		Unit labour cost		Canadian unit labour cost in U.S. $
	Canada	U.S.	Canada	U.S.	Canada	U.S.	
1981	4.9	3.6	15.1	9.8	9.7	6.1	7.0
1982	-4.5	4.0	10.6	9.3	15.8	5.2	12.6
1983	7.3	2.2	6.1	2.7	-1.1	0.4	-1.0
1984	8.5	1.3	4.7	3.1	-3.4	2.0	-8.1
1985	2.9	3.2	5.2	5.0	2.2	1.8	-3.1
1986	-1.6	2.6	3.9	4.1	5.5	1.4	3.7
1987	0.9	6.5	3.0	2.2	2.0	-4.0	6.9
1988	0.4	2.2	4.4	3.9	4.0	1.7	12.0
1989	0.4	0.6	3.8	4.0	3.3	3.3	7.4
1990	1.7	1.8	5.6	5.3	3.9	3.5	5.4
1991	0.7	1.9	6.1	5.3	5.3	3.4	7.2
1992	4.2	4.3	4.3	4.4	0.1	0.1	-5.1
1993	2.3	5.1	0.5	2.8	-1.7	-2.2	-7.9

While recent comparisons of aggregate productivity between Canada and the U.S. are interesting, a detailed industry by industry analysis provides greater insight. Multifactor productivity indices, based upon net-gross output, are available for 15 comparable industries and the total manufacturing sector in Canada and the U.S.[4]. Unfortunately, the data is only available at this level of detail up to 1991, so that a certain loss of timeliness is necessary in order to gain detail.

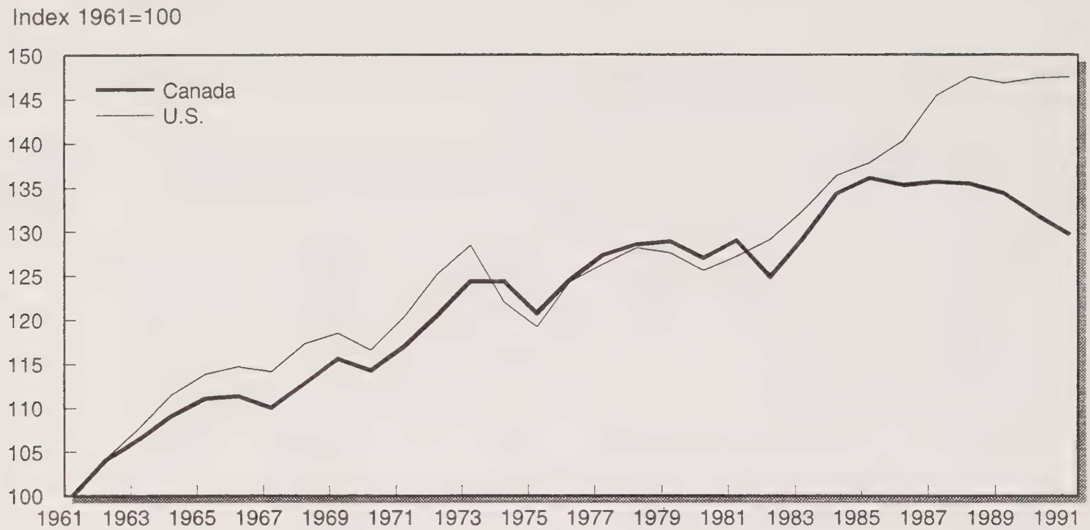
2.3 - Manufacturing Multifactor Productivity Growth in Canada and the United States

During the overall period of 1961 to 1991, United States manufacturing industries enjoyed a superior annual rate of growth in multifactor productivity than that experienced by Canadian manufacturers. The U.S. had a compound annual rate of growth of 1.3% for the manufacturing sector, while Canadian manufacturers realised annual growth of 0.9%. The cumulative effect of this 0.4 percentage point difference over 30 years is significant.

4. For the purposes of comparability, the forestry industry had to be added to total manufacturing in Canada in order to be consistent with the U.S. definition. The 15 comparable industries represent approximately 90% of manufacturing output in both countries. For more details on the comparability of U.S. and Canadian industries, please see the special study by Marie-Allard Saulnier in the 1991 issue of this publication.

Figure 8

Since 1985, Canadian manufacturing MFP experienced a significant break from its' historical trend



An examination of figure 8, manufacturing MFP in Canada and the U.S., reveals an empirical method of dividing the preceding 30 years into two sub-periods based upon what appears to be a significant change in the Canadian trend in multifactor productivity[5]. Between 1961 and 1985 the difference between the index of MFP in Canada and the U.S. was never greater than 5.0 points, with an average differential of 1.5. After 1985 the difference between indexes was always greater than 5.0 points with an average differential of 10.6.

In other words, up to 1985 indexes of MFP were very similar in each country, but after 1985 multifactor productivity in the Canadian manufacturing sector has significantly declined while the U.S. has continued upon its' historical path. In fact, between 1961 to 1985 the compound growth rates of MFP were equal in Canada and the U.S. at 1.3% annually. But during the 1985 to 1991 period Canadian multifactor productivity in the manufacturing industries declined on average 0.8% each year, while the U.S. MFP continued to rise at 1.1% per annum. This explains the significant difference in MFP over the entire 1961-1991 period.

2.4 - Relative Performance of Individual Industries

Compound growth rates of multifactor productivity in each of the 15 individual industries display a distinct pattern over the two periods. Between 1961 and 1985 Canadian manufacturers had higher rates of MFP growth in 10 of 15 industries, but during the second period the pattern is reversed so that U.S. manufacturers enjoyed higher productivity growth in all 15 industries (see tables 4 and 5).

5. The traditional business cycle approach to this analysis was also utilized, but, as figure 8 reveals, the more interesting analysis centers around the break in Canadian MFP growth that occurred in 1985.

Table 3

Multifactor productivity indices for comparable manufacturing industries in Canada and the United States, (1961=100)

Year	Total manufacturing industries		Food & beverage industries		Plastic & rubber products industries		Leather & allied products industries	
	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	104.1	104.2	101.5	102.5	108.5	102.4	103.5	102.1
1963	106.4	107.7	102.0	104.0	110.5	102.9	104.0	103.9
1964	109.1	111.5	103.0	104.6	112.6	106.0	107.4	107.1
1965	111.0	113.8	104.3	105.8	113.9	107.3	106.9	106.8
1966	111.3	114.7	104.7	106.4	116.1	107.8	106.7	102.9
1967	110.0	114.1	106.0	107.2	114.8	110.3	106.2	105.9
1968	112.7	117.3	105.5	108.4	121.3	114.7	107.2	108.7
1969	115.6	118.5	106.1	109.7	123.8	117.5	109.1	107.9
1970	114.2	116.6	106.7	109.9	120.4	113.8	109.9	108.4
1971	117.0	120.3	109.5	110.5	122.6	119.4	111.6	109.3
1972	120.5	125.1	109.9	113.9	124.1	122.6	111.3	104.2
1973	124.3	128.5	111.8	111.1	127.4	124.9	112.8	110.5
1974	124.4	122.1	111.4	105.7	121.2	115.1	114.0	114.9
1975	120.7	119.2	109.1	106.6	116.1	112.0	113.8	118.2
1976	124.5	124.3	112.2	110.9	121.1	112.3	120.1	116.9
1977	127.3	126.3	113.9	108.7	126.9	115.3	121.5	114.6
1978	128.6	128.2	113.8	112.0	130.5	115.6	129.5	113.0
1979	128.9	127.6	113.9	112.6	134.8	113.9	127.8	105.1
1980	127.0	125.6	112.6	114.1	131.7	113.4	126.2	114.4
1981	129.0	127.2	112.3	114.1	133.1	117.3	127.9	113.2
1982	124.9	129.1	112.3	121.2	129.9	119.7	124.2	114.8
1983	129.3	132.4	111.4	121.5	136.4	122.5	128.7	113.7
1984	134.2	136.3	112.6	122.2	143.8	124.3	132.2	112.8
1985	136.1	137.8	113.8	123.3	144.2	129.0	132.2	112.0
1986	135.2	140.3	112.9	121.5	137.6	128.0	133.0	107.1
1987	135.6	145.3	112.8	123.8	138.6	132.3	133.3	115.7
1988	135.4	147.5	110.8	123.9	135.5	129.0	135.0	113.5
1989	134.3	146.8	109.6	122.9	133.6	131.3	136.2	114.0
1990	131.9	147.4	109.3	120.8	131.3	136.6	132.5	112.8
1991	129.6	147.5	108.4	120.8	127.5	142.5	127.9	116.6

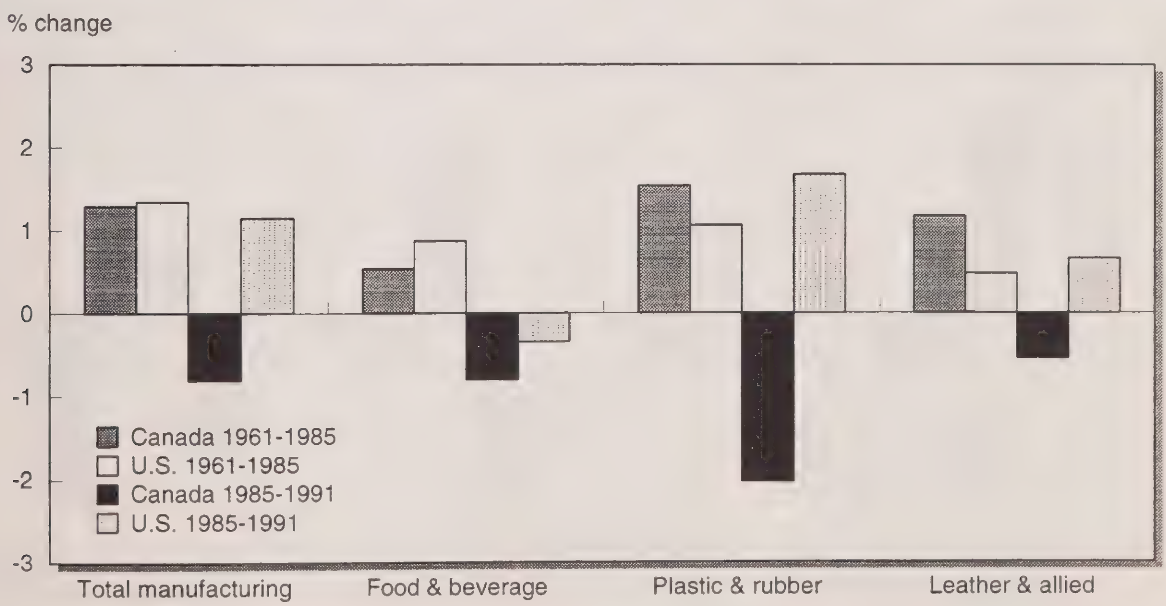


Table 3

Multifactor productivity Indices for selected manufacturing industries in Canada and the United States, (1961=100), continued

Year	Textile & textile products industries		Clothing industries		Wood & lumber industries		Furniture & fixture industries	
	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	108.2	102.3	102.3	101.1	103.0	104.0	102.0	101.1
1963	112.5	103.8	104.0	102.0	108.2	109.6	104.8	101.1
1964	113.7	107.1	104.1	103.4	109.7	112.1	104.4	102.3
1965	111.2	110.7	105.2	104.1	109.1	114.6	107.7	105.1
1966	109.8	114.3	105.9	103.9	110.0	111.9	109.2	104.7
1967	109.6	115.4	104.4	105.9	110.3	117.7	109.0	103.3
1968	117.5	116.6	106.5	108.2	116.2	117.4	110.6	104.5
1969	122.9	120.4	106.3	108.5	119.0	111.7	113.7	106.7
1970	121.3	126.4	106.1	108.3	120.5	120.4	110.6	102.9
1971	127.1	128.7	108.9	109.9	121.3	119.5	112.1	104.5
1972	135.2	130.2	111.0	113.0	122.5	121.2	119.6	110.6
1973	137.0	128.7	113.6	113.7	123.2	116.8	123.5	111.1
1974	137.4	124.6	113.7	115.2	122.2	117.3	112.5	107.9
1975	137.8	129.7	115.6	119.2	117.7	123.2	110.9	108.1
1976	142.3	130.9	118.8	119.7	124.6	122.4	116.8	111.9
1977	149.0	138.8	121.4	122.3	129.9	120.1	118.0	113.7
1978	156.7	142.0	126.1	125.8	129.7	116.1	123.0	114.8
1979	162.3	146.0	128.9	127.0	129.6	115.8	120.0	112.7
1980	162.8	147.5	128.6	127.6	135.2	118.9	118.4	116.1
1981	167.4	148.3	129.8	128.5	138.1	117.8	119.9	116.3
1982	157.1	155.3	126.1	129.9	136.1	123.3	108.3	117.0
1983	173.3	159.1	124.7	131.8	146.9	127.0	115.3	117.8
1984	174.3	159.8	128.4	132.1	158.2	133.5	117.9	118.7
1985	176.8	160.6	130.4	134.8	164.0	134.7	119.0	118.9
1986	183.2	163.1	132.2	136.8	167.4	139.7	116.6	118.1
1987	183.0	164.2	133.0	140.8	172.7	147.5	110.8	120.9
1988	179.2	163.7	130.2	141.4	171.2	147.1	107.7	118.6
1989	176.2	166.0	130.5	143.5	168.4	146.8	107.5	117.8
1990	173.0	166.8	129.2	143.7	164.6	141.7	106.0	116.1
1991	171.2	165.5	128.6	144.2	161.5	144.2	103.3	116.6

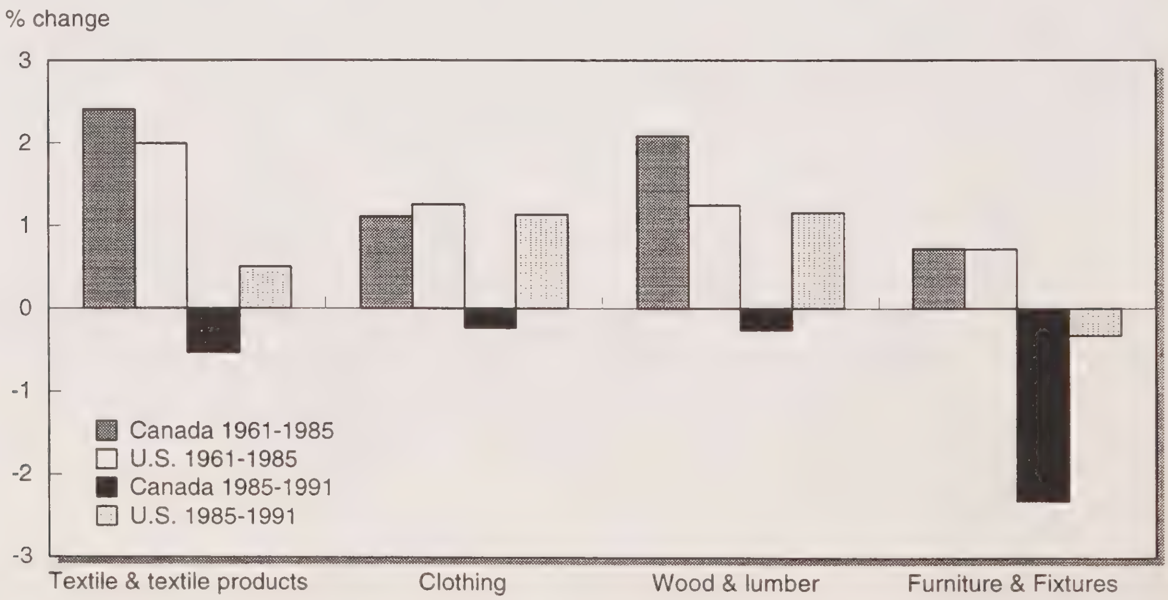


Table 3

Multifactor productivity indices for comparable manufacturing industries in Canada and the United States, (1961=100), continued

Year	Paper & allied products industries		Printing publishing & allied industries		Primary metal industries		Machinery, electrical electronic products ind.	
	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	99.9	101.5	101.9	101.6	102.6	103.5	107.2	104.3
1963	101.3	104.6	102.2	101.0	103.6	106.7	108.8	106.7
1964	103.8	107.1	101.7	104.1	105.8	109.3	113.3	111.2
1965	102.2	108.5	101.2	105.6	108.1	110.9	115.7	115.3
1966	101.5	109.1	102.2	106.1	107.7	111.9	116.9	116.8
1967	97.2	106.8	102.4	105.6	104.6	109.4	112.9	115.6
1968	97.9	111.1	103.1	106.4	108.6	110.0	115.0	116.2
1969	100.8	113.4	103.8	106.4	109.6	108.1	118.8	119.0
1970	100.6	110.2	102.5	102.5	108.8	104.5	117.7	119.0
1971	100.5	114.0	103.5	103.7	108.4	106.2	114.8	120.5
1972	103.7	119.2	106.8	106.2	110.4	109.3	119.3	127.4
1973	107.1	124.5	111.1	107.5	112.9	113.7	124.0	133.2
1974	109.6	118.8	110.7	105.1	113.9	110.1	124.6	129.2
1975	96.7	111.0	112.1	101.5	110.9	102.1	121.2	124.5
1976	103.8	115.3	118.5	102.4	107.7	102.4	124.8	131.7
1977	103.5	117.3	122.9	104.7	111.7	100.6	128.7	139.7
1978	105.8	119.6	125.5	104.9	113.6	102.9	128.9	143.5
1979	106.9	117.8	124.9	105.3	108.6	101.4	136.8	146.4
1980	105.5	114.2	124.7	103.1	106.0	102.0	139.2	148.9
1981	105.2	114.0	125.8	103.5	109.8	104.8	138.6	153.4
1982	98.5	117.8	119.5	102.6	102.8	100.7	130.8	151.5
1983	103.5	121.7	122.6	102.1	109.4	98.3	130.3	159.1
1984	105.0	122.0	126.0	102.0	113.9	100.9	140.4	168.8
1985	105.2	122.1	125.8	101.0	118.1	101.3	142.4	173.7
1986	105.5	125.7	124.1	100.0	116.9	106.9	143.9	179.1
1987	107.1	126.4	120.9	101.8	120.1	104.3	143.4	192.1
1988	105.1	125.9	120.3	99.0	120.0	99.2	146.5	205.0
1989	99.3	123.5	118.5	96.8	120.1	97.8	147.4	210.3
1990	94.9	122.5	114.1	94.3	116.8	103.0	147.8	215.1
1991	95.0	125.8	107.9	91.9	117.5	110.1	143.6	218.9

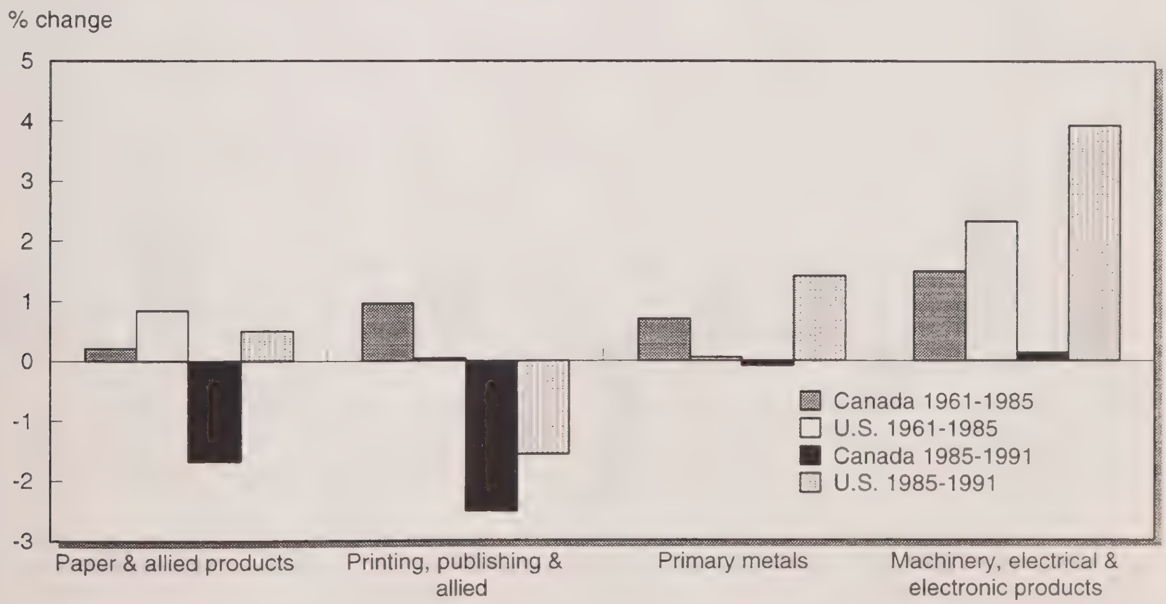
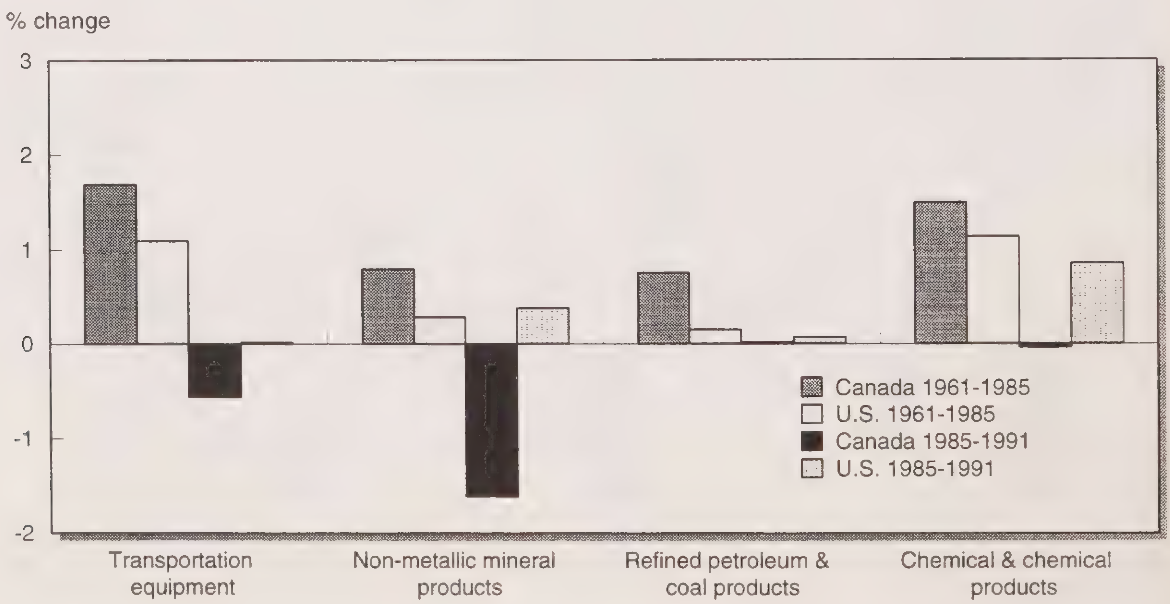


Table 3

Multifactor productivity indices for comparable manufacturing industries in Canada and the United States, (1961=100), concluded

Year	Transportation equipment industries		Non-metallic mineral products industries		Refined petroleum & coal product ind.		Chemical & chemical products industries	
	Canada	U.S.	Canada	U.S.	Canada	U.S.	Canada	U.S.
1961	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1962	104.5	108.2	107.1	101.1	105.4	96.2	103.4	103.9
1963	108.9	111.0	108.4	104.5	106.4	101.6	106.6	108.7
1964	110.2	116.2	112.4	106.8	108.8	102.7	111.0	112.4
1965	115.0	116.0	114.3	108.2	111.2	102.8	113.2	114.5
1966	112.9	116.4	115.2	107.9	113.1	102.9	114.1	114.7
1967	118.1	113.4	108.0	106.0	108.4	103.1	111.9	112.9
1968	120.8	117.1	112.8	108.3	110.6	104.7	112.7	120.1
1969	127.2	116.3	115.0	109.1	109.0	105.1	114.7	122.1
1970	122.3	109.7	113.3	106.1	109.3	107.1	114.1	124.0
1971	129.1	120.4	121.6	107.0	109.8	107.9	118.8	129.4
1972	133.3	121.9	131.0	110.3	109.6	109.0	122.0	136.2
1973	138.9	127.1	123.8	111.6	113.9	110.2	128.1	141.1
1974	140.2	122.0	118.7	108.0	113.3	107.7	128.1	126.9
1975	143.1	122.3	114.9	106.8	114.1	106.7	120.0	118.3
1976	145.0	130.6	116.3	107.8	113.4	107.4	125.8	124.0
1977	146.2	130.8	115.0	107.0	117.0	108.1	125.0	127.5
1978	146.6	129.7	117.1	106.3	114.4	108.5	128.9	128.9
1979	146.4	124.4	117.7	104.2	112.8	106.6	132.5	127.8
1980	137.6	116.4	110.6	102.0	113.3	105.5	128.2	119.0
1981	139.7	116.4	110.0	101.7	115.9	103.2	133.1	121.4
1982	138.2	122.1	102.7	98.4	118.6	102.4	124.3	122.8
1983	142.2	127.6	109.7	102.8	120.4	101.9	135.6	130.1
1984	147.6	131.4	115.5	105.5	121.1	103.1	140.9	131.0
1985	149.4	129.8	120.8	107.1	119.7	103.6	142.6	131.1
1986	147.4	130.0	122.9	109.4	118.4	105.0	143.3	138.8
1987	144.8	132.6	125.6	110.7	119.3	104.7	146.2	145.3
1988	147.2	134.2	125.4	110.7	119.7	105.5	148.6	145.1
1989	148.0	133.3	122.3	112.0	119.4	104.6	150.9	143.3
1990	145.4	132.4	115.4	111.5	119.9	103.9	148.3	143.2
1991	144.4	130.0	109.5	109.5	119.8	104.0	142.3	137.9



It is interesting to study the gap between growth in Canadian MFP and growth in U.S. MFP. In the 10 industries where Canada had higher rates of growth during the earlier years, the gap between Canada and the U.S. was 0.6% on average. But, during the second period the average gap was 1.6% in favour of the U.S.. Further, the two largest gaps in Canada's favour during the first period are found in the Printing and Publishing industry (1.0%) and the Wood Products industry (0.9%). In the later period the two largest gaps in favour of the U.S. are much more significant, and are found in the Machinery, Electrical and Electronic products industry (3.8%), and the Plastic and Rubber Products industry (3.7%).

Table 4

Growth rates in multifactor productivity between Canada and the United States for comparable manufacturing industries

Industry	1961-1991		1961-1985		1985-1991	
	Canada	U.S.	Canada	U.S.	Canada	U.S.
Total manufacturing	0.9	1.3	1.3	1.3	-0.8	1.1
Food & beverage	0.3	0:6	0.5	0.9	-0.8	-0.3
Plastic & rubber	0.8	1.2	1.5	1.1	-2.0	1.7
Leather & allied products	0.8	0.5	1.2	0.5	-0.5	0.7
Textile & textile products	1.8	1.7	2.4	2.0	-0.5	0.5
Clothing	0.8	1.2	1.1	1.3	-0.2	1.1
Wood & lumber	1.6	1.2	2.1	1.2	-0.3	1.2
Furniture & fixtures	0.1	0.5	0.7	0.7	-2.3	-0.3
Paper & allied products	-0.2	0.8	0.2	0.8	-1.7	0.5
Printing, publishing & allied	0.3	-0.3	1.0	0.0	-2.5	-1.6
Primary metals	0.5	0.3	0.7	0.1	-0.1	1.4
Machinery, electrical, & electronic products	1.2	2.7	1.5	2.3	0.1	3.9
Transportation equipment	1.2	0.9	1.7	1.1	-0.6	0.0
Non-metallic mineral products	0.3	0.3	0.8	0.3	-1.6	0.4
Refined petroleum & coal products	0.6	0.1	0.8	0.1	0.0	0.1
Chemical & chemical products	1.2	1.1	1.5	1.1	0.0	0.9

When the entire period from 1961 to 1991 is considered as a single unit, the picture for Canadian manufacturers appears to be much improved. The annual growth rate of multifactor productivity in 8 of the 15 industries in this comparison was greater in Canada, and represented 48% of Canadian manufacturing net-gross output. The U.S. had higher growth rates in 6 of the remaining industries, which represented 42% of U.S. manufacturing net-gross output. Multifactor productivity growth was equal between countries in the non-metallic mineral products industry. In spite of this positive picture for Canadian industries, U.S. manufacturers still realised higher overall productivity gains compared to Canadian manufacturers.

The difference between MFP growth rates over the entire 1961-1991 period can largely be attributed to the superior performance of the Machinery, Electric and Electronic Products

industry[6] in the U.S.. First, this industry represents 9.0% of manufacturing net-gross output in Canada compared to 14.8% in the United States. Secondly, MFP over the 1961-1991 period had an annual growth rate of 2.7% in the U.S. compared to 1.2% in Canada. In short, this industry plays a much more important role in the manufacturing industry in the U.S., and is enjoying a significantly greater rate of growth in productivity.

Table 5

Who leads multifactor productivity growth in manufacturing industries?

Industry	1961-1985	1985-1991	1961-1991
Total manufacturing	SAME	U.S.	U.S.
Food & beverage	U.S.	U.S.	U.S.
Plastic & rubber	CDN	U.S.	U.S.
Leather & allied products	CDN	U.S.	CDN
Textile & textile products	CDN	U.S.	CDN
Clothing	U.S.	U.S.	U.S.
Wood & lumber	CDN	U.S.	CDN
Furniture & fixtures	SAME	U.S.	U.S.
Paper & allied products	U.S.	U.S.	U.S.
Printing, publishing & allied	CDN	U.S.	CDN
Primary metals	CDN	U.S.	CDN
Machinery, electrical, & electronic products	U.S.	U.S.	U.S.
Transportation equipment	CDN	U.S.	CDN
Non-metallic mineral products	CDN	U.S.	SAME
Refined petroleum & coal products	CDN	U.S.	CDN
Chemical & chemical products	CDN	U.S.	CDN

Figures 9 and 10 will also shed some light on the contribution of each industry to the overall growth in manufacturing productivity. The contribution of each industry is calculated as the industry net gross output divided by net gross output for the entire manufacturing sector multiplied by the growth rate of MFP for that industry from 1961-1991. The most distinctive feature of the charts is the impact in the U.S. of the Machinery, Electrical and Electronic products industry on the growth rate of multifactor productivity for the entire manufacturing industry. Its' contribution is almost four times as large as the transportation equipment industry, which is the next most significant contributor. The Canadian chart tells a much different story from that of the U.S. in that the contributions of each industry are more evenly distributed. In fact, the three largest contributors to Canadian manufacturing MFP growth are just equal to the single largest U.S. contributor.

6. This industry includes everything from agricultural implements to sophisticated telecommunications equipment, including the computer hardware industry, which explains the relatively greater importance of the industry in the U.S.

Figure 9

Average annual contribution of Canadian manufacturing industries to the growth of total manufacturing MFP, 1961-1991

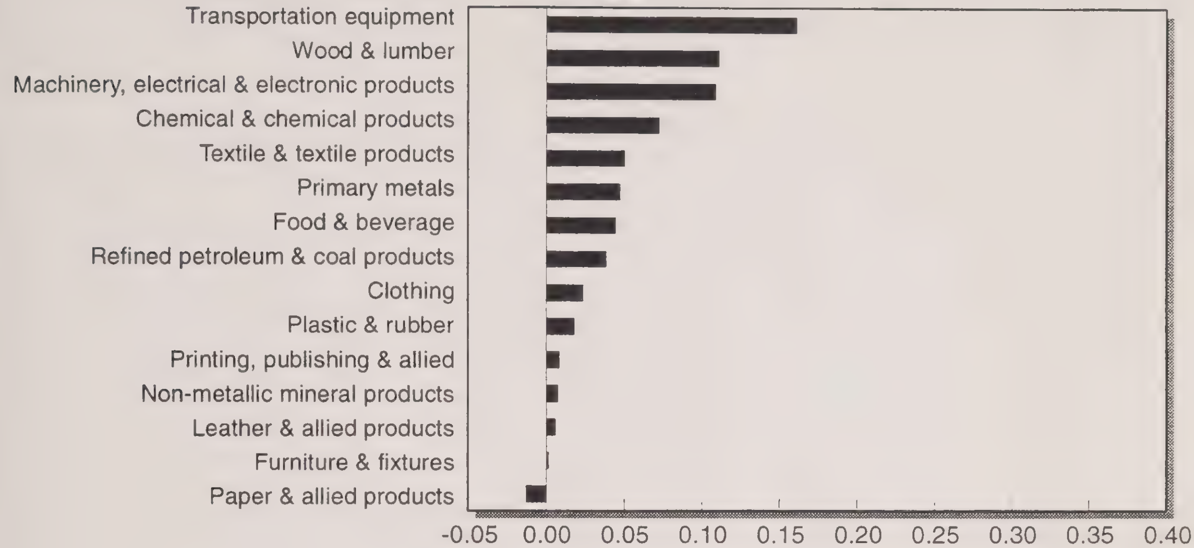


Figure 10

Average annual contribution of U.S. manufacturing industries to the growth of total manufacturing MFP, 1961-1991

PART 1

Multifactor Productivity

Experimental Data

Table 1

Breakdown of annual growth in real value added, business sector industries

Year	(1) Hours worked	(2) Labour share	(3) Labour contri-bution	(4) Capital service	(5) Capital share	(6) Capital contri-bution	(7) Multifactor produc-tivity	(8) Gross domestic product	(9) Capital/ labour ratio
	Δ %	%	Δ %	Δ %	%	Δ %	Δ %	Δ %	Δ %
			(1 × 2)			(4 × 5)		(3 + 6 + 7)	((4-1) x5)
1973	5.5	63.3	3.5	4.6	36.7	1.7	3.4	8.5	-0.3
1974	4.3	63.2	2.7	6.6	36.8	2.4	-2.3	2.8	0.8
1975	0.0	63.8	0.0	6.5	36.2	2.3	-1.7	0.7	2.3
1976	1.0	63.4	0.7	5.7	36.6	2.1	4.0	6.7	1.7
1977	1.2	63.9	0.8	4.8	36.1	1.7	0.9	3.4	1.3
1978	3.3	64.0	2.1	3.7	36.0	1.3	-0.3	3.1	0.1
1979	3.6	63.5	2.3	3.2	36.5	1.2	0.7	4.1	-0.1
1980	1.5	64.0	0.9	6.2	36.0	2.2	-1.0	2.1	1.7
1981	1.7	64.4	1.1	7.8	35.6	2.8	0.6	4.5	2.2
1982	-5.4	64.4	-3.5	7.1	35.6	2.5	-4.0	-5.0	4.5
1983	-0.8	63.0	-0.5	1.6	37.0	0.6	3.9	4.0	0.9
1984	3.3	63.3	2.1	1.2	36.7	0.4	4.0	6.5	-0.8
1985	4.7	64.4	3.0	2.3	35.6	0.8	0.8	4.7	-0.9
1986	1.9	63.2	1.2	3.6	36.8	1.3	0.8	3.4	0.6
1987	3.9	62.6	2.4	3.6	37.4	1.3	0.9	4.7	-0.1
1988	4.6	63.2	2.9	4.4	36.8	1.6	-0.1	4.4	-0.1
1989	1.5	64.0	1.0	5.5	36.0	2.0	-0.4	2.5	1.4
1990	-0.2	65.1	-0.2	5.3	34.9	1.9	-3.4	-1.7	1.9
1991	-4.3	66.1	-2.9	3.1	33.9	1.1	-1.4	-3.2	2.5
1992	-1.4	68.1	-1.0	3.8	31.9	1.2	0.1	0.4	1.7
1993	2.4	68.3	1.6	1.8	31.7	0.6	0.9	3.1	-0.2

Table 2

Breakdown of annual growth in real value added, manufacturing industries

Year	(1) Hours worked	(2) Labour share	(3) Labour contri-bution	(4) Capital service	(5) Capital share	(6) Capital contri-bution	(7) Multifactor produc-tivity	(8) Gross domestic product	(9) Capital/ labour ratio
	Δ %	%	Δ %	Δ %	%	Δ %	Δ %	Δ %	Δ %
			(1 × 2)			(4 × 5)		(3 + 6 + 7)	((4-1) x5)
1973	4.1	68.1	2.8	1.7	32.2	0.6	6.8	10.4	-0.7
1974	1.8	67.1	1.2	3.7	33.2	1.2	0.3	2.7	0.6
1975	-3.7	68.1	-2.5	4.5	32.2	1.4	-6.2	-7.2	2.7
1976	0.6	67.5	0.4	1.8	32.7	0.6	6.7	7.8	0.4
1977	-1.1	66.9	-0.7	0.0	33.3	0.0	5.1	4.3	0.4
1978	3.5	67.8	2.3	0.5	32.5	0.2	2.0	4.6	-0.9
1979	2.6	67.5	1.7	0.4	32.8	0.1	0.6	2.4	-0.7
1980	-0.6	67.9	-0.4	2.7	32.4	0.9	-3.6	-3.1	1.1
1981	-1.2	67.9	-0.8	8.8	32.4	2.8	3.9	5.9	3.2
1982	-8.7	69.1	-6.1	7.4	31.1	2.3	-7.8	-11.4	5.2
1983	-1.2	67.4	-0.8	1.4	32.8	0.5	8.2	7.8	0.9
1984	4.1	66.1	2.7	-2.4	34.2	-0.8	9.0	11.0	-2.2
1985	2.2	68.4	1.5	-0.1	31.9	0.0	3.2	4.7	-0.7
1986	1.6	66.0	1.1	3.1	34.3	1.0	-1.7	0.3	0.5
1987	3.4	63.5	2.1	5.6	36.7	2.0	0.6	4.8	0.8
1988	4.6	62.7	2.9	6.3	37.5	2.3	-0.5	4.7	0.6
1989	0.3	63.1	0.2	6.5	37.2	2.4	-1.7	0.8	2.2
1990	-5.3	63.6	-3.4	7.6	36.7	2.7	-4.0	-4.7	4.8
1991	-7.1	64.3	-4.6	3.7	36.0	1.3	-3.6	-6.8	4.0
1992	-3.3	69.4	-2.3	2.8	30.9	0.9	2.3	0.8	1.9
1993	2.6	70.8	1.8	-0.9	29.5	-0.3	3.2	4.8	-1.0

Table 3

Indices of multifactor productivity, partial productivity and total unit cost, agricultural & related services industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	88.7	85.9	66.6	66.2	106.4	88.6	86.4	83.1	44.4
1974	79.4	75.5	61.9	61.9	91.9	82.7	77.0	74.8	57.3
1975	85.1	79.2	65.6	73.9	100.6	90.3	82.8	80.2	56.9
1976	90.2	79.8	74.0	81.9	107.1	98.1	87.9	85.7	53.5
1977	88.8	75.1	77.8	80.8	104.2	99.7	86.5	84.2	53.2
1978	87.1	74.8	79.1	78.9	97.7	96.1	84.8	82.1	61.1
1979	83.0	72.3	76.3	74.1	92.5	88.2	80.6	78.3	72.3
1980	85.7	72.9	84.0	80.0	93.6	89.7	83.4	80.6	77.0
1981	90.3	77.3	88.4	89.8	98.3	91.6	88.1	85.2	102.6
1982	93.0	78.1	94.1	92.7	100.0	97.2	91.4	87.0	100.0
1983	92.8	79.8	93.2	92.6	98.9	97.0	91.2	88.7	98.7
1984	93.2	82.6	91.9	91.6	99.1	96.4	91.7	90.6	105.6
1985	91.8	85.6	89.6	92.1	96.3	91.9	89.9	89.5	105.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	98.5	109.6	101.2	93.8	93.4	95.8	98.2	98.9	97.2
1988	99.2	114.5	103.0	87.9	93.1	95.0	99.0	100.1	107.4
1989	105.3	124.2	106.5	88.8	101.8	96.3	106.4	107.4	104.4
1990	107.4	139.9	112.2	93.6	100.4	91.3	109.0	109.1	100.6
1991	108.8	151.5	113.4	99.4	98.9	92.5	110.8	110.6	100.0

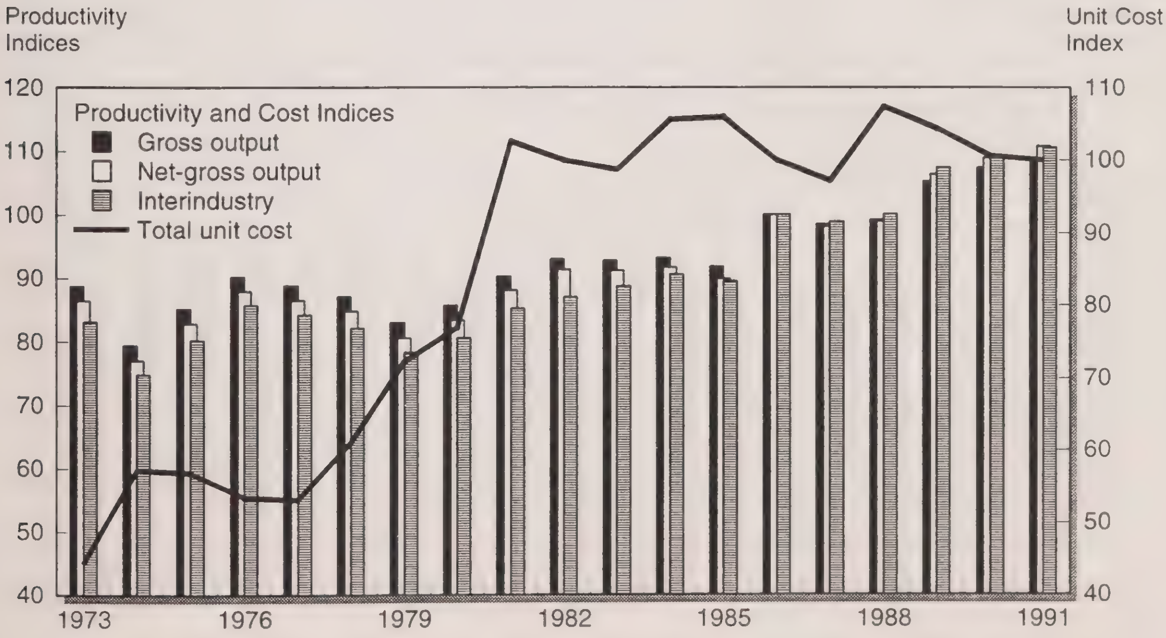


Table 4

Indices of multifactor productivity, partial productivity and total unit cost, manufacturing industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	94.3	107.0	77.3	90.7	96.7	111.8	92.7	93.4	35.1
1974	94.4	106.5	78.8	88.1	96.6	110.2	92.8	92.0	42.4
1975	92.4	95.9	76.9	90.2	96.4	107.3	90.2	89.0	48.0
1976	94.5	99.6	81.1	91.2	97.0	109.2	92.8	92.5	50.6
1977	96.0	102.1	84.1	91.5	97.9	109.9	94.9	94.2	54.3
1978	96.7	106.9	85.4	91.3	97.9	108.4	95.7	94.7	59.5
1979	96.9	111.4	87.4	90.9	97.3	105.1	96.0	95.3	68.1
1980	95.7	107.2	86.7	88.9	96.9	101.9	94.5	93.2	77.2
1981	96.9	99.9	88.7	92.0	99.0	103.2	96.0	93.8	86.6
1982	94.5	83.3	86.9	94.3	99.0	99.8	92.9	90.2	92.3
1983	96.9	86.1	92.7	96.8	99.5	103.3	96.0	93.8	95.1
1984	99.6	96.1	97.7	96.6	100.5	103.0	99.4	98.6	99.1
1985	100.6	101.0	99.7	100.5	100.5	102.4	100.7	100.1	100.7
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.2	99.5	100.8	101.1	99.9	100.7	100.3	100.8	103.3
1988	100.0	99.7	102.5	103.2	98.8	100.4	100.0	101.0	107.4
1989	99.4	94.9	103.7	104.3	98.4	100.5	99.2	100.4	110.3
1990	98.0	84.5	104.8	99.5	98.0	101.4	97.4	98.2	111.2
1991	96.8	76.8	106.2	89.3	97.6	101.3	95.9	96.8	109.8

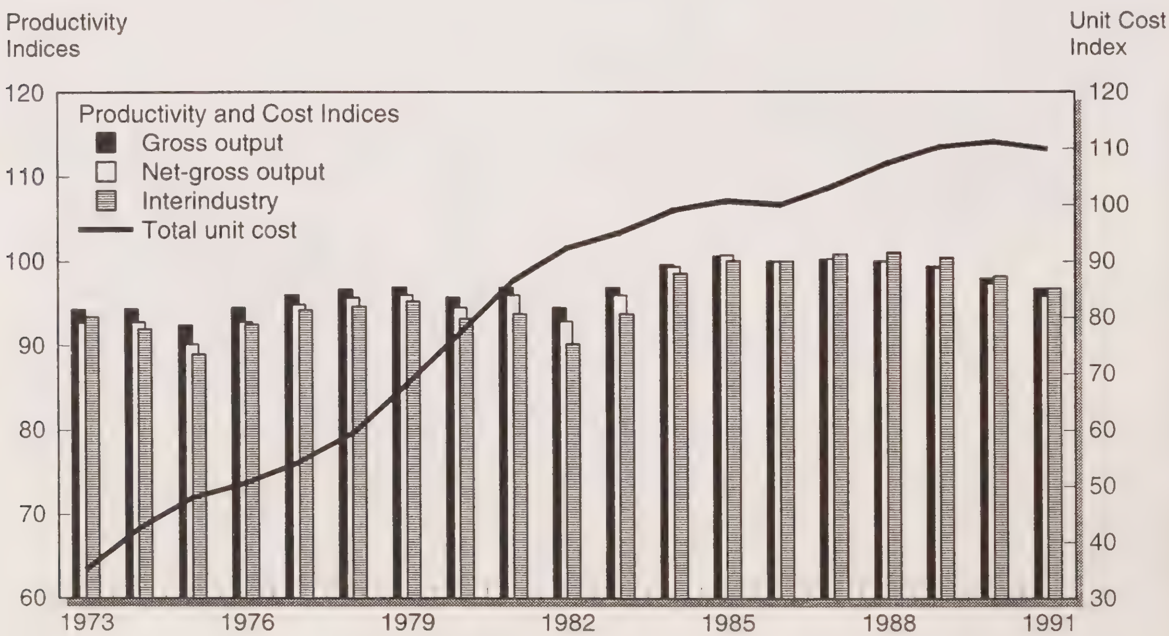


Table 5

Indices of multifactor productivity, partial productivity and total unit cost, construction industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	90.4	154.3	78.5	84.5	84.6	109.1	90.4	88.3	39.8
1974	89.4	148.0	77.0	84.9	85.1	106.9	89.4	86.6	47.4
1975	93.4	146.2	82.6	87.8	88.9	108.0	93.4	88.8	52.1
1976	96.4	143.4	83.5	104.1	95.3	108.6	96.4	92.8	55.8
1977	98.2	129.7	87.2	98.4	97.9	108.3	98.2	94.8	58.7
1978	96.3	119.6	89.1	87.2	94.7	103.8	96.3	93.4	62.6
1979	94.8	117.9	88.1	82.0	93.9	100.2	94.8	92.5	68.1
1980	96.9	115.6	91.4	81.2	99.7	94.4	96.9	94.2	74.9
1981	100.8	116.0	96.3	97.5	105.5	93.9	100.8	97.9	83.6
1982	104.6	99.8	100.5	104.2	116.2	95.2	104.6	98.4	88.7
1983	104.2	95.8	101.6	109.4	110.0	101.9	104.2	100.3	91.1
1984	101.5	94.0	101.7	102.9	106.9	95.5	101.5	100.2	94.2
1985	98.9	100.2	99.1	98.5	100.4	95.8	98.9	99.0	96.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.1	105.9	99.6	103.7	95.4	102.7	99.1	99.8	105.4
1988	97.7	105.6	95.9	127.7	96.6	98.5	97.7	98.6	110.8
1989	97.9	103.0	96.7	136.9	93.9	103.7	97.9	98.3	116.2
1990	97.1	93.4	95.4	131.2	96.7	100.3	97.1	96.1	118.7
1991	96.8	82.3	97.4	114.8	97.0	98.3	96.8	95.0	115.7

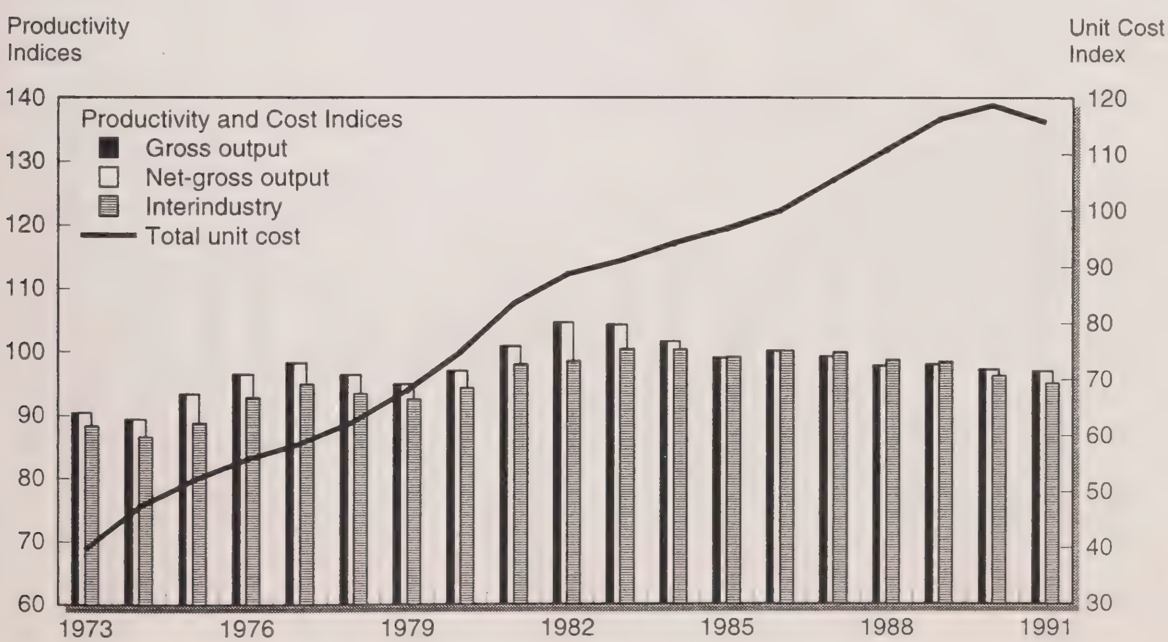


Table 6

Indices of multifactor productivity, partial productivity and total unit cost, transportation & storage industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	90.9	93.1	77.8	76.8	85.4	120.3	89.8	92.7	35.7
1974	90.5	93.3	77.2	82.6	82.7	118.6	89.4	91.9	41.0
1975	90.0	89.9	77.2	74.6	89.0	120.1	88.8	90.4	46.4
1976	90.5	89.4	78.3	78.2	85.9	119.8	89.4	91.1	51.8
1977	91.4	95.4	78.7	80.4	90.0	116.1	90.3	92.3	56.1
1978	92.6	101.6	80.1	80.4	92.6	114.0	91.7	93.2	60.4
1979	97.1	112.1	88.2	80.7	93.9	111.2	96.8	98.2	63.4
1980	93.1	105.7	84.6	78.0	88.5	107.9	92.3	93.6	72.1
1981	92.6	100.1	83.7	82.9	89.2	107.5	91.7	92.8	82.7
1982	92.0	89.3	84.0	88.4	86.6	107.9	91.0	90.9	90.6
1983	97.5	90.0	91.5	96.8	94.5	110.8	97.2	97.7	94.1
1984	100.0	95.9	97.1	99.7	106.1	104.5	100.0	100.2	95.9
1985	100.2	97.2	100.3	98.3	97.6	102.9	100.2	100.7	99.7
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.2	107.2	105.1	105.0	96.7	99.9	103.7	103.6	101.1
1988	106.0	114.0	109.3	106.9	95.2	100.6	106.9	106.7	99.0
1989	104.9	113.3	111.0	105.2	93.1	97.1	105.6	105.3	103.8
1990	103.8	113.3	111.8	98.7	96.5	94.4	104.3	102.8	108.6
1991	102.3	111.0	109.6	95.0	97.2	94.2	102.7	100.5	113.5

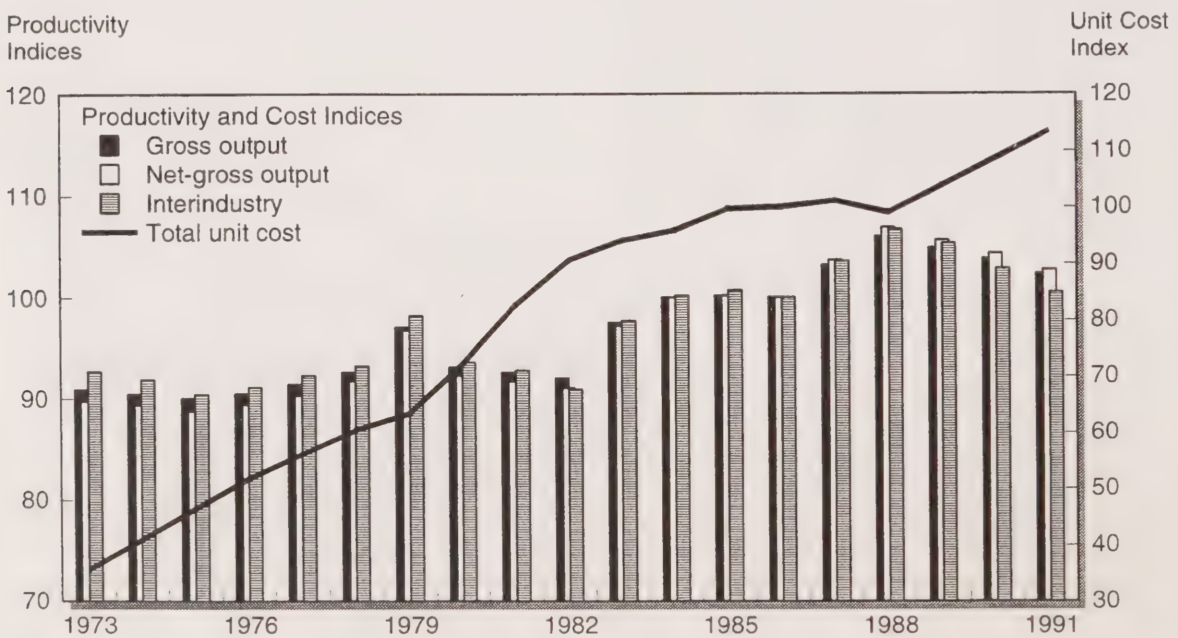


Table 7

Indices of multifactor productivity, partial productivity and total unit cost, telecommunication industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	60.9	62.3	46.9	75.2	95.3	89.8	60.0	60.3	53.8
1974	64.4	66.1	49.2	79.4	109.4	93.6	63.5	63.8	55.1
1975	69.1	68.6	54.6	87.4	106.9	105.4	68.3	68.4	57.8
1976	70.9	69.0	57.8	96.2	111.8	104.5	70.2	70.5	61.7
1977	72.4	69.9	60.1	91.3	113.6	104.3	71.7	72.1	65.1
1978	76.1	73.5	64.8	91.0	120.9	101.5	75.4	75.7	68.7
1979	80.8	79.6	69.1	91.8	120.3	104.0	80.3	80.7	71.4
1980	86.7	86.3	76.3	95.7	111.1	106.8	86.3	86.8	73.0
1981	89.5	88.2	80.1	98.5	108.7	110.9	89.2	89.7	79.8
1982	86.5	83.3	78.5	101.7	107.9	108.3	86.1	85.9	89.4
1983	88.9	83.9	84.1	104.7	104.7	108.7	88.6	88.5	93.9
1984	93.4	90.2	90.1	98.8	103.8	105.8	93.2	93.4	97.9
1985	96.4	95.2	94.1	95.8	100.7	102.8	96.3	96.2	99.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.6	104.9	106.4	101.8	103.8	100.9	104.8	104.7	98.3
1988	105.6	107.0	108.4	107.4	88.2	105.6	105.7	105.4	97.3
1989	110.9	109.0	118.5	126.5	94.8	108.0	111.2	110.3	96.7
1990	113.4	105.2	128.3	146.9	103.8	108.4	113.8	111.9	97.3
1991	114.4	98.8	135.3	167.8	111.1	115.7	114.9	112.8	98.1

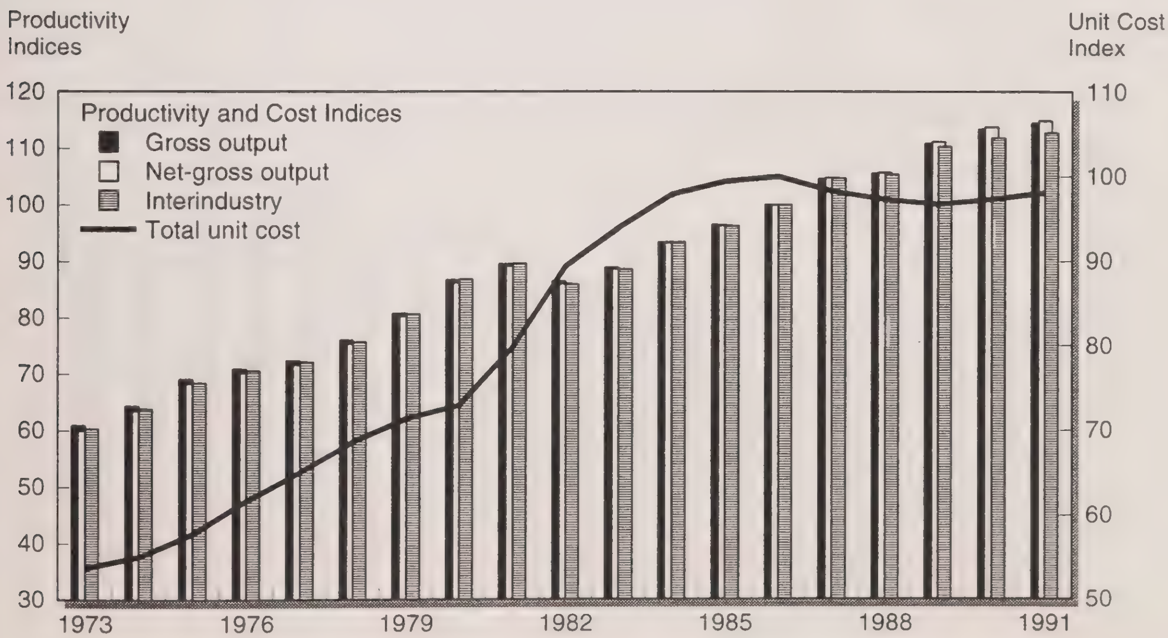


Table 8

Indices of multifactor productivity, partial productivity and total unit cost, wholesale trade industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	88.2	108.5	79.0	82.5	74.5	104.9	88.0	88.0	41.1
1974	88.3	106.3	80.0	81.0	79.2	102.6	88.2	87.9	47.9
1975	88.7	102.4	81.4	77.3	82.4	102.9	88.5	87.7	54.0
1976	90.5	99.7	84.9	87.2	83.8	101.5	90.3	89.8	57.8
1977	87.1	92.4	82.7	79.0	79.0	99.2	86.9	86.6	59.8
1978	85.0	92.3	80.4	70.4	79.1	97.1	84.8	84.5	64.0
1979	88.6	100.6	85.3	69.7	81.2	94.9	88.4	88.5	71.4
1980	92.5	99.0	92.3	69.5	85.6	95.2	92.4	92.0	77.0
1981	93.1	98.2	91.2	80.4	93.6	96.2	93.0	92.5	83.2
1982	89.8	87.3	89.7	83.5	95.7	90.9	89.7	88.1	90.2
1983	93.0	96.5	89.9	90.7	94.5	97.7	92.9	91.8	93.8
1984	94.0	97.7	91.0	87.1	95.0	99.4	93.9	93.7	97.3
1985	97.3	98.9	94.9	95.0	97.3	102.3	97.3	97.2	97.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.6	102.6	100.6	112.1	103.1	101.4	101.6	101.9	102.3
1988	103.8	105.6	104.3	120.5	100.8	100.2	103.9	104.2	106.7
1989	105.1	105.7	106.7	126.6	102.1	99.6	105.2	105.3	110.6
1990	102.1	100.8	102.8	118.5	116.0	96.2	102.1	101.3	113.7
1991	102.2	94.7	105.2	103.9	122.0	95.6	102.2	101.1	114.3

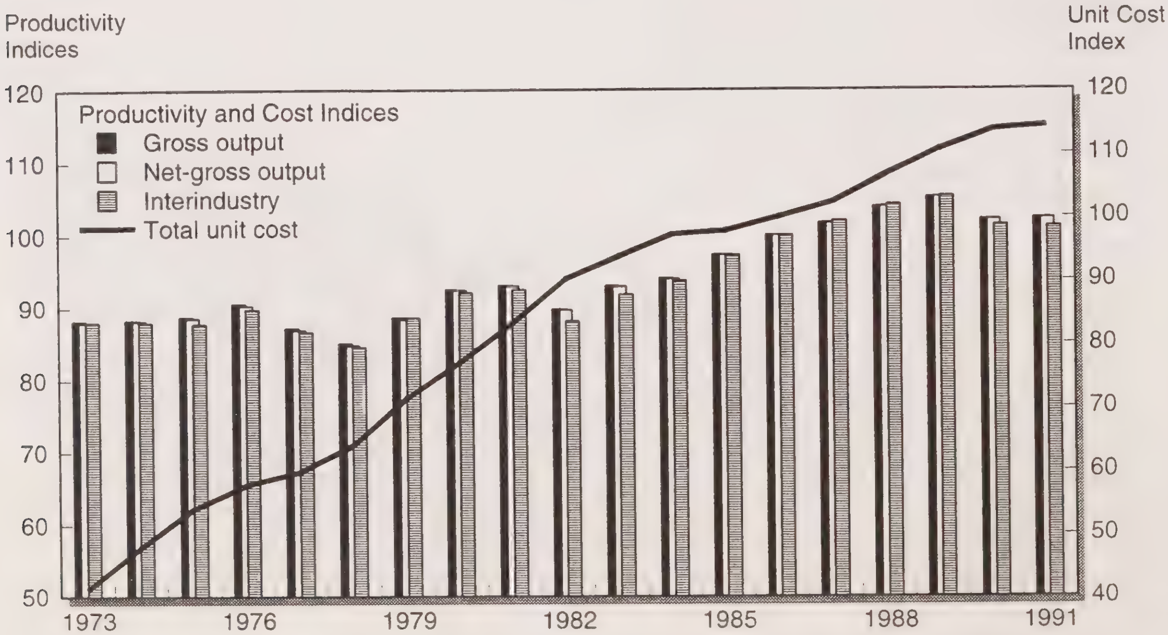


Table 9

Indices of multifactor productivity, partial productivity and total unit cost, retail trade industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	92.1	75.2	88.6	87.6	72.2	131.6	92.0	92.1	37.2
1974	90.7	75.9	87.1	88.8	71.3	128.0	90.7	90.2	41.9
1975	92.1	76.6	88.8	89.5	71.8	129.4	92.1	91.2	47.6
1976	96.1	80.6	93.1	99.0	78.2	128.0	96.1	95.8	51.5
1977	96.5	81.9	94.4	94.0	77.8	124.5	96.5	96.2	54.1
1978	95.8	86.5	93.9	89.3	77.4	119.2	95.7	95.4	58.0
1979	94.8	88.0	91.8	87.0	85.7	114.8	94.8	94.6	64.3
1980	93.0	88.4	90.3	83.7	83.9	110.4	92.9	92.6	71.6
1981	91.8	87.9	87.8	92.6	90.1	107.9	91.8	91.5	79.5
1982	92.1	83.2	89.4	93.7	96.8	104.2	92.1	90.5	87.3
1983	99.1	91.2	98.5	98.7	100.0	105.6	99.1	97.9	89.1
1984	99.3	95.9	97.5	95.6	100.8	106.6	99.3	98.9	92.9
1985	99.9	97.3	98.7	97.5	102.1	104.8	99.9	99.7	96.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.3	102.2	104.9	104.6	103.6	100.0	103.4	103.4	104.3
1988	103.6	101.8	106.4	108.3	106.7	96.4	103.6	103.4	109.4
1989	104.0	100.6	108.3	112.3	108.3	94.1	104.1	103.6	113.5
1990	101.9	96.4	106.3	101.5	126.4	90.1	102.0	100.5	118.0
1991	100.5	91.9	106.2	91.7	130.6	87.3	100.5	98.7	121.3

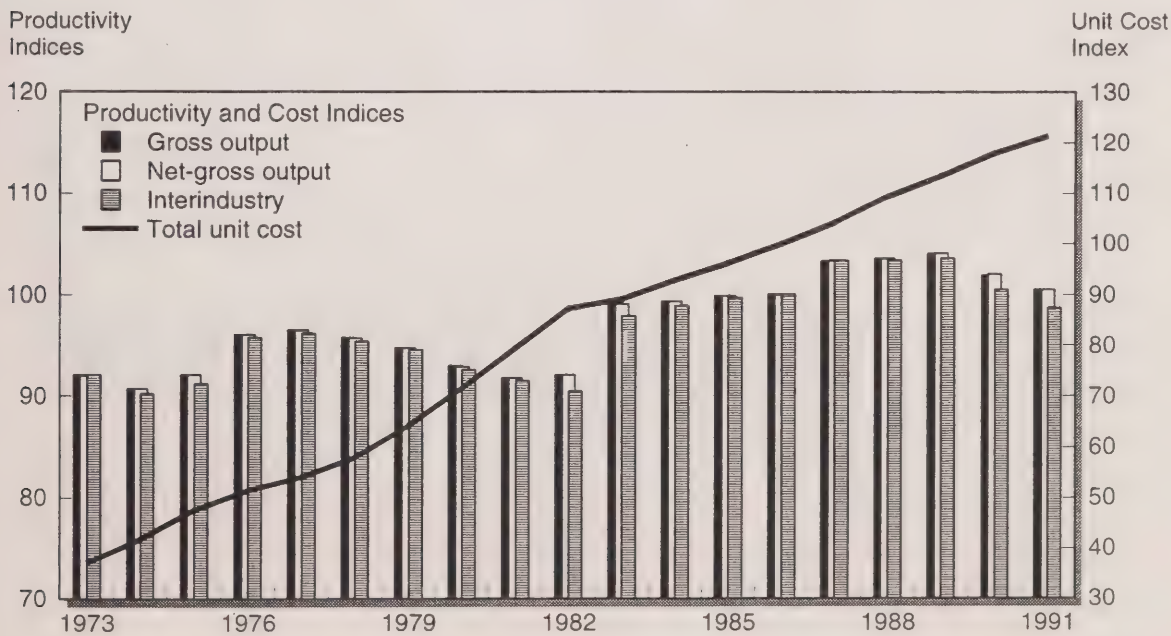


Table 10

Indices of multifactor productivity, partial productivity and total unit cost, food industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	97.7	109.0	75.8	88.0	101.2	104.4	97.3	91.8	40.9
1974	97.6	107.8	78.1	88.8	100.5	104.0	97.1	86.6	48.2
1975	96.0	102.9	77.2	86.5	99.0	103.0	95.3	86.0	53.8
1976	98.6	107.9	82.9	94.7	100.1	107.5	98.4	92.0	53.7
1977	99.7	111.6	85.5	95.5	100.4	108.1	99.6	93.0	56.7
1978	99.7	112.4	86.4	95.4	100.3	106.4	99.6	92.3	63.6
1979	99.8	111.9	87.7	90.4	100.7	103.4	99.7	90.6	72.0
1980	98.7	109.2	89.9	89.5	99.0	103.4	98.5	89.9	77.9
1981	98.5	101.7	93.8	97.3	98.0	106.3	98.2	91.7	85.4
1982	98.9	99.2	96.0	99.7	98.5	105.0	98.6	92.1	89.1
1983	98.2	95.8	96.5	101.8	97.9	105.0	97.9	92.9	91.5
1984	99.1	97.6	98.2	102.9	98.7	103.5	98.9	95.4	96.1
1985	100.4	100.7	100.2	107.4	99.7	103.9	100.5	97.0	96.7
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.7	100.1	101.0	105.2	99.4	98.3	99.6	99.5	103.0
1988	97.7	94.7	98.3	102.5	98.5	95.8	97.4	97.4	106.7
1989	96.3	90.0	98.1	108.6	97.9	92.0	95.8	98.0	109.5
1990	95.9	84.6	98.2	105.7	98.3	93.1	95.3	97.6	112.0
1991	95.8	81.3	101.0	101.0	98.6	92.4	95.2	97.3	112.3

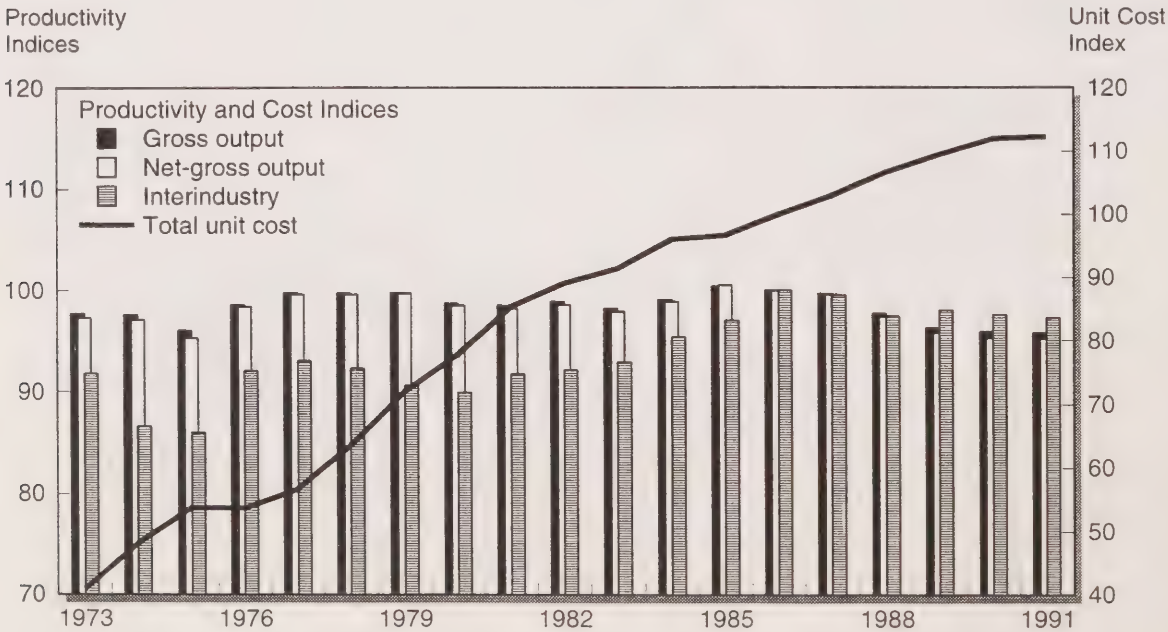


Table 11

Indices of multifactor productivity, partial productivity and total unit cost, beverage industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	109.6	98.8	90.3	85.9	130.6	114.8	110.2	108.5	32.4
1974	107.8	97.2	88.1	88.6	129.3	112.2	108.3	105.6	37.6
1975	105.3	94.9	85.1	86.6	127.2	109.0	105.6	101.5	43.6
1976	105.0	98.5	84.5	90.8	123.9	109.3	105.4	103.6	45.1
1977	108.0	104.3	86.6	90.2	126.6	110.2	108.5	106.7	47.5
1978	107.3	102.4	87.4	91.0	125.4	108.8	107.7	106.6	51.0
1979	107.8	107.5	89.1	85.8	123.0	106.6	108.2	107.1	55.9
1980	107.5	108.2	92.1	83.3	121.5	101.9	108.0	106.1	64.6
1981	107.2	108.6	94.4	90.4	117.6	103.0	107.6	106.4	73.8
1982	104.3	107.0	93.6	92.7	112.1	99.9	104.6	101.4	82.6
1983	103.5	108.8	94.2	97.3	107.6	100.5	103.8	102.3	89.0
1984	104.4	107.2	98.3	95.5	107.7	102.5	104.7	104.9	93.0
1985	102.2	103.5	98.7	103.5	103.2	102.7	102.3	102.8	96.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.3	106.1	102.1	108.9	98.6	99.0	101.3	101.6	102.6
1988	102.6	111.5	103.5	110.8	98.0	99.8	102.8	103.1	109.2
1989	105.3	105.1	118.4	122.4	102.3	96.8	105.6	105.7	110.3
1990	106.1	100.3	128.1	129.6	104.0	96.1	106.5	105.5	112.7
1991	101.1	92.2	126.9	120.3	101.0	89.0	101.3	99.8	120.2

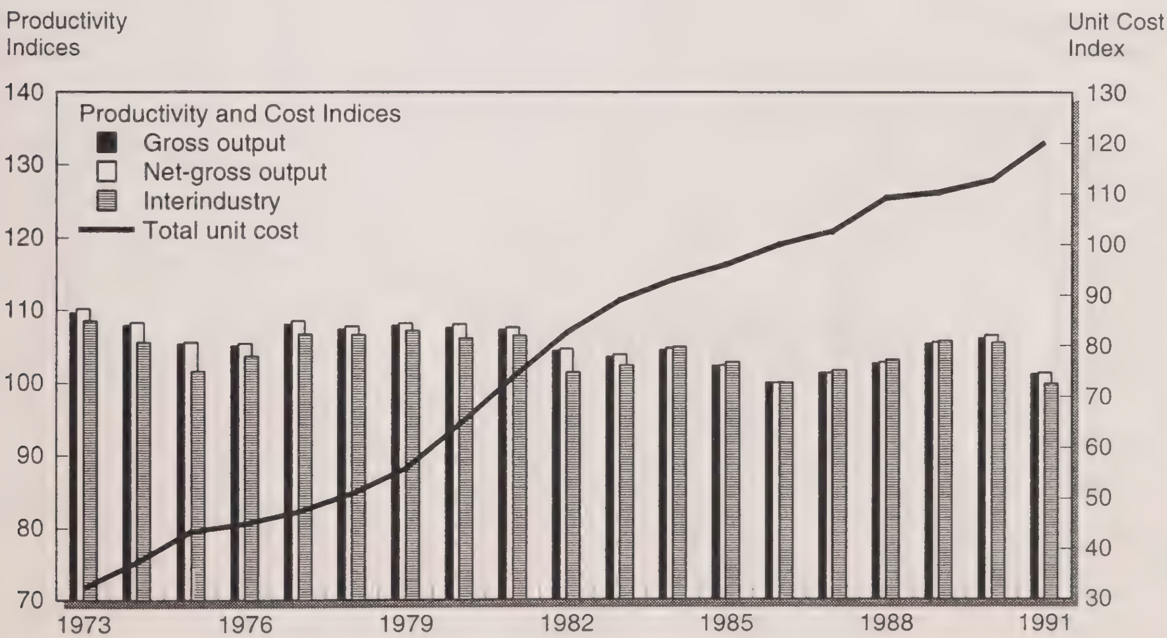


Table 12

Indices of multifactor productivity, partial productivity and total unit cost, tobacco products industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	104.6	125.6	73.7	96.5	106.7	115.5	105.1	100.5	33.6
1974	107.6	141.7	80.1	106.3	103.8	124.9	108.8	100.8	35.7
1975	106.0	124.2	75.9	108.6	107.8	120.2	106.9	100.1	42.0
1976	104.9	125.5	82.9	110.9	103.3	117.5	105.6	101.5	45.4
1977	112.8	138.6	88.2	108.4	111.7	120.0	115.2	110.5	47.0
1978	107.4	137.1	86.5	103.4	103.8	116.3	108.7	104.0	51.7
1979	108.2	138.4	89.5	105.3	104.1	115.3	109.7	104.2	56.3
1980	109.3	129.2	88.6	93.1	110.7	107.9	111.0	105.9	62.4
1981	108.6	129.6	90.8	112.7	107.5	110.9	110.2	106.8	70.1
1982	108.7	128.1	90.3	104.7	108.3	111.3	110.3	105.5	78.2
1983	105.7	111.1	88.4	100.1	110.4	106.2	106.7	104.0	84.5
1984	104.5	111.2	94.9	96.4	105.5	105.5	105.3	104.0	89.1
1985	99.5	97.2	87.4	96.1	105.5	99.8	99.4	98.1	94.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.2	93.4	103.8	102.6	115.8	97.3	106.0	106.0	105.5
1988	109.5	98.2	111.3	103.2	118.6	100.4	110.8	110.8	112.9
1989	107.9	102.4	120.0	109.9	108.4	98.8	108.9	109.5	120.3
1990	105.6	95.6	118.1	103.6	108.2	101.5	106.2	106.1	128.0
1991	107.1	100.0	118.7	96.1	108.7	99.3	108.0	107.7	135.2

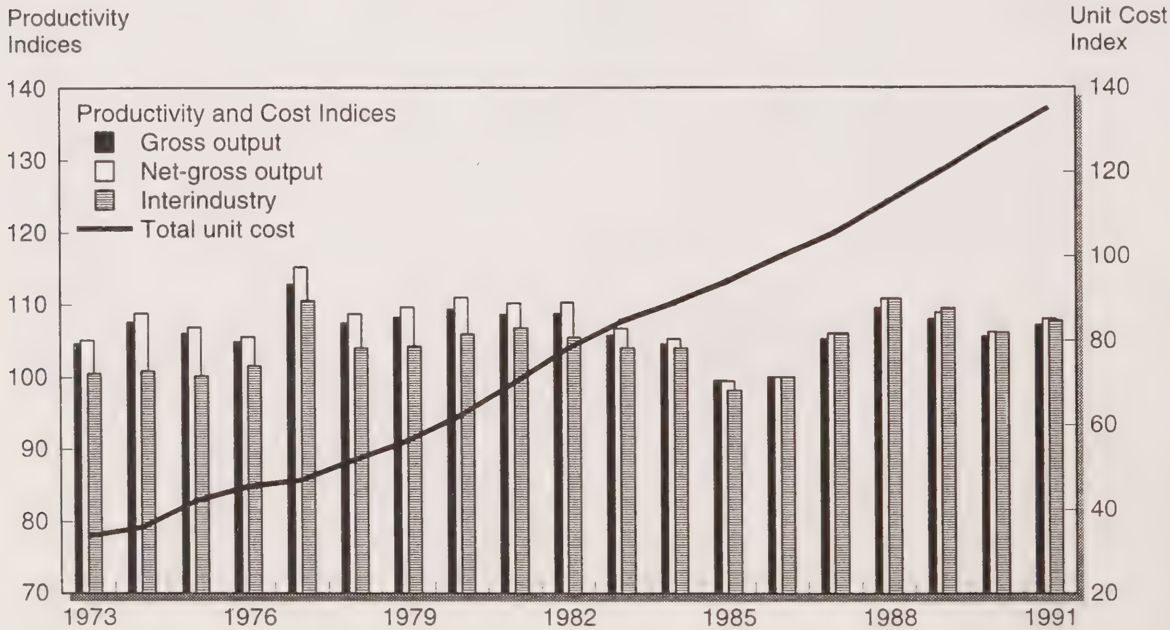


Table 13

Indices of multifactor productivity, partial productivity and total unit cost, plastic products industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	97.6	91.6	77.2	103.5	106.7	110.6	97.5	97.0	34.0
1974	92.6	81.7	78.2	91.0	100.5	103.2	92.4	91.3	45.4
1975	88.3	65.3	72.5	99.8	101.0	101.8	87.9	84.2	50.5
1976	88.9	70.1	76.0	97.1	97.4	105.3	88.5	86.0	53.5
1977	90.5	72.9	79.0	95.3	98.3	105.0	90.2	87.1	56.4
1978	93.8	83.3	81.8	102.2	99.3	109.6	93.6	91.1	59.4
1979	96.9	95.2	86.3	95.3	100.1	108.6	96.8	96.6	66.7
1980	95.1	87.1	86.2	86.3	99.8	105.1	94.9	93.0	76.5
1981	98.8	97.4	91.1	93.8	102.1	103.0	98.7	97.1	82.8
1982	97.5	90.0	90.8	91.3	101.8	101.5	97.4	92.4	86.6
1983	101.5	101.6	99.5	95.8	101.6	105.7	101.5	99.2	89.8
1984	103.9	111.0	99.7	97.5	103.8	105.6	104.1	103.9	93.7
1985	103.8	108.1	98.5	98.6	105.4	103.5	103.9	103.6	96.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.0	90.1	103.3	102.9	98.9	102.5	99.0	100.2	103.7
1988	96.0	82.1	96.8	94.8	98.3	103.5	95.8	98.1	112.4
1989	94.5	74.9	94.1	95.5	98.3	105.5	94.2	96.7	115.7
1990	92.3	66.2	93.6	90.6	97.8	103.8	92.0	93.1	114.8
1991	89.7	57.7	90.7	81.6	98.5	103.3	89.4	89.9	113.6

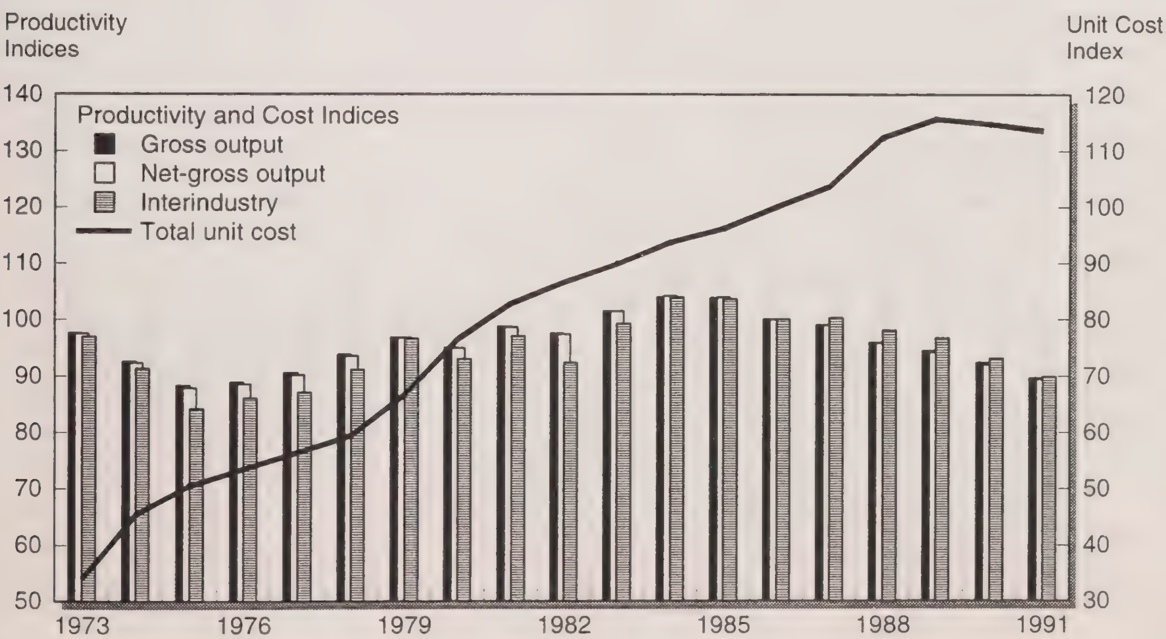


Table 14

Indices of multifactor productivity, partial productivity and total unit cost, rubber products industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	88.6	75.9	78.9	85.6	92.0	117.0	88.3	87.1	39.5
1974	84.7	62.7	73.5	76.9	93.9	113.4	84.3	83.0	47.3
1975	81.9	61.0	71.7	72.4	89.6	111.9	81.4	78.5	52.7
1976	88.3	70.1	78.8	80.2	94.5	118.0	88.0	85.5	54.2
1977	95.0	82.6	86.4	85.6	98.4	124.9	94.8	92.2	56.9
1978	96.6	89.1	86.3	86.7	100.5	125.5	96.5	94.4	60.0
1979	99.7	106.9	91.7	93.5	100.5	120.1	99.6	98.9	66.5
1980	96.9	97.3	87.9	87.7	101.4	111.5	96.8	94.7	77.2
1981	94.5	94.0	85.1	92.5	98.5	111.3	94.3	92.9	87.1
1982	91.2	74.5	81.9	92.7	99.6	100.4	90.9	87.0	93.7
1983	96.3	74.3	88.3	95.1	103.7	108.1	96.2	93.7	95.3
1984	105.1	94.6	102.3	102.6	107.7	110.2	105.2	104.4	96.4
1985	106.0	99.5	103.5	108.3	108.4	107.2	106.1	105.7	98.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.8	99.4	105.3	101.3	103.2	104.2	103.9	104.6	100.0
1988	103.3	101.3	100.2	106.0	105.1	105.6	103.4	104.4	102.8
1989	102.5	92.8	101.8	106.3	104.8	101.0	102.5	103.5	105.9
1990	102.3	73.1	101.6	105.1	105.5	106.8	102.3	102.1	108.2
1991	99.2	54.5	100.5	96.5	104.7	104.6	99.2	98.4	109.6

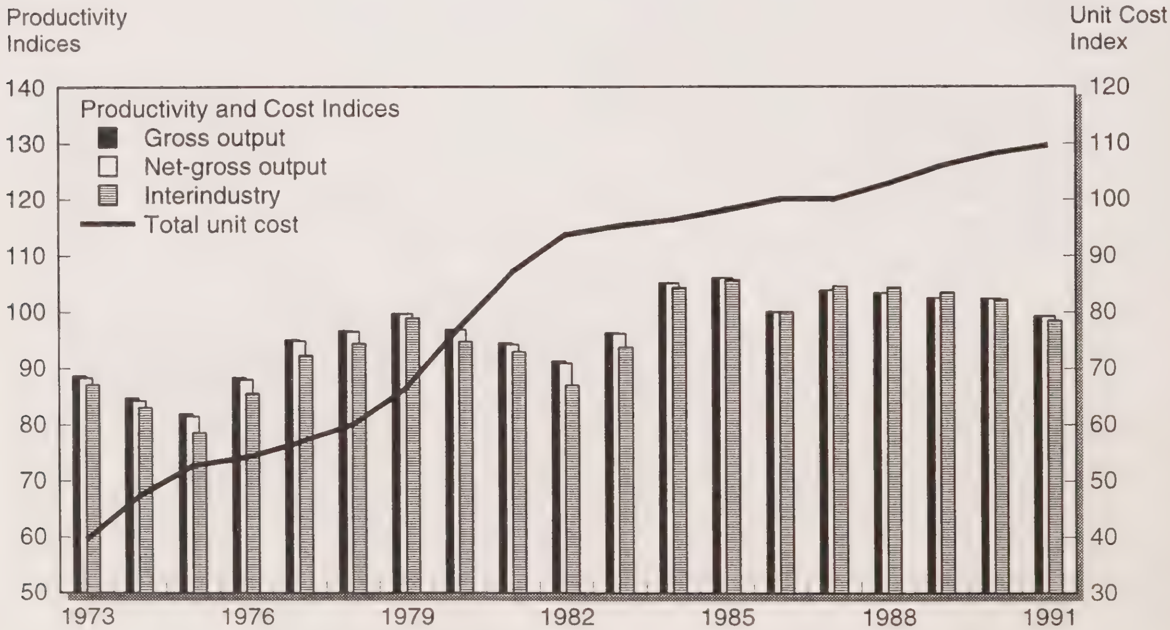


Table 15

Indices of multifactor productivity, partial productivity and total unit cost, leather & allied products industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	86.0	87.7	78.2	76.3	86.5	106.4	84.8	81.8	39.1
1974	86.9	92.3	81.5	83.0	85.1	105.8	85.8	82.2	43.5
1975	86.7	86.6	82.5	84.4	85.0	104.3	85.6	81.0	46.8
1976	91.1	96.9	88.0	90.0	88.0	106.5	90.3	87.4	51.1
1977	92.0	92.7	90.0	84.4	89.3	106.6	91.3	88.8	54.9
1978	97.5	110.5	98.7	89.9	91.4	108.8	97.4	94.9	60.1
1979	96.4	114.2	95.4	90.5	91.1	107.2	96.1	94.9	73.8
1980	95.3	110.7	94.5	84.4	91.3	101.4	94.9	92.6	77.2
1981	96.4	113.9	95.7	94.8	91.7	103.2	96.1	94.2	83.2
1982	94.0	94.1	91.9	101.1	94.3	97.4	93.4	90.1	88.3
1983	97.1	99.6	96.0	100.4	96.1	100.4	96.8	94.7	91.3
1984	99.5	103.0	96.8	94.9	99.8	102.7	99.4	99.1	96.2
1985	99.5	104.9	101.2	103.9	96.9	99.7	99.4	99.2	98.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.2	98.5	104.4	103.3	97.9	99.4	100.2	100.3	105.7
1988	101.4	91.5	106.1	90.4	101.2	98.7	101.5	100.9	107.0
1989	102.3	92.5	107.5	100.0	100.8	101.1	102.4	101.6	110.4
1990	99.7	83.9	104.7	96.3	97.2	107.5	99.7	98.4	116.2
1991	96.5	67.0	103.3	85.9	95.9	106.6	96.2	94.7	115.4

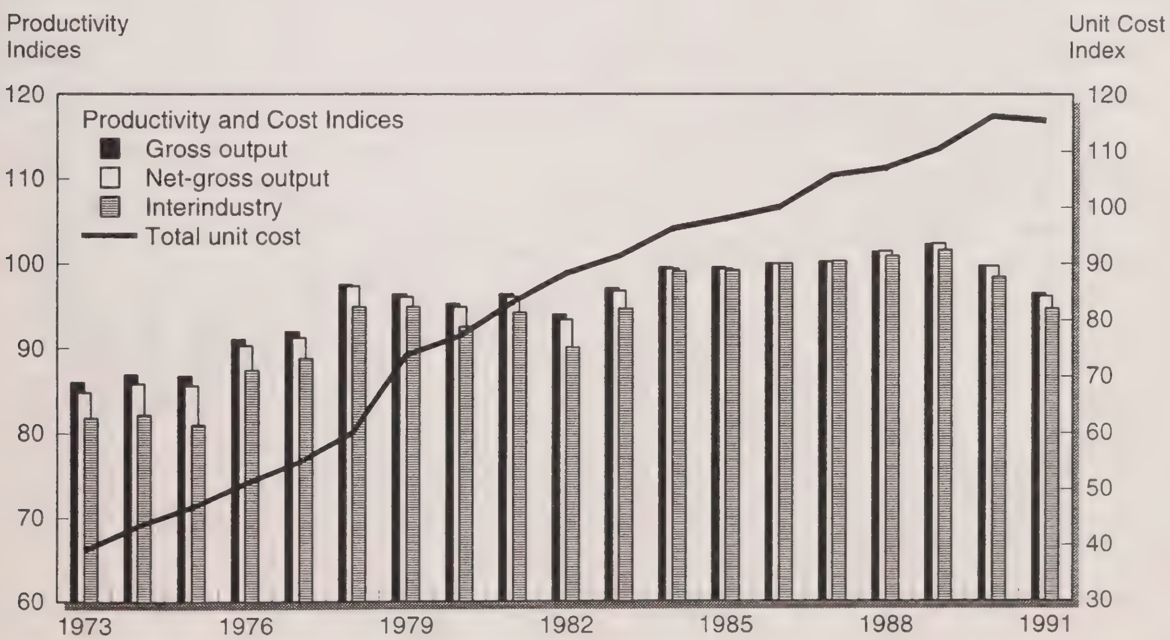


Table 16

Indices of multifactor productivity, partial productivity and total unit cost, primary textile & textile products industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	79.0	66.7	60.0	71.2	96.2	77.9	74.8	77.7	44.7
1974	79.2	62.1	59.8	69.3	99.0	77.2	75.0	77.3	52.9
1975	79.4	56.7	61.1	66.4	99.3	80.4	75.2	76.5	54.3
1976	81.5	56.3	65.8	69.9	99.7	82.4	77.7	79.8	57.7
1977	84.6	61.5	72.6	74.4	98.8	86.2	81.3	83.2	61.0
1978	88.1	72.7	76.3	76.1	100.2	88.5	85.5	87.1	64.0
1979	90.6	85.2	80.7	78.0	98.9	91.2	88.6	90.5	71.9
1980	90.8	87.0	79.3	73.2	99.7	92.4	88.9	90.0	81.2
1981	92.9	86.9	82.9	77.9	101.0	95.3	91.4	92.0	89.5
1982	88.3	73.8	77.9	79.6	99.4	87.2	85.7	85.3	92.9
1983	95.6	92.3	88.9	88.5	99.8	99.2	94.6	94.5	95.0
1984	96.0	92.9	89.9	88.8	100.2	98.4	95.2	96.2	97.6
1985	97.1	91.4	94.5	99.1	99.9	97.8	96.5	97.1	98.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.9	100.7	103.6	104.9	97.9	98.9	99.9	100.1	102.2
1988	98.2	97.0	101.0	96.8	98.7	92.5	97.8	98.1	106.6
1989	96.9	92.0	101.4	98.9	96.9	92.6	96.2	97.0	109.4
1990	95.4	82.5	101.9	90.8	96.6	92.6	94.4	94.7	111.0
1991	94.6	73.6	100.2	84.6	98.4	94.4	93.5	93.6	110.9

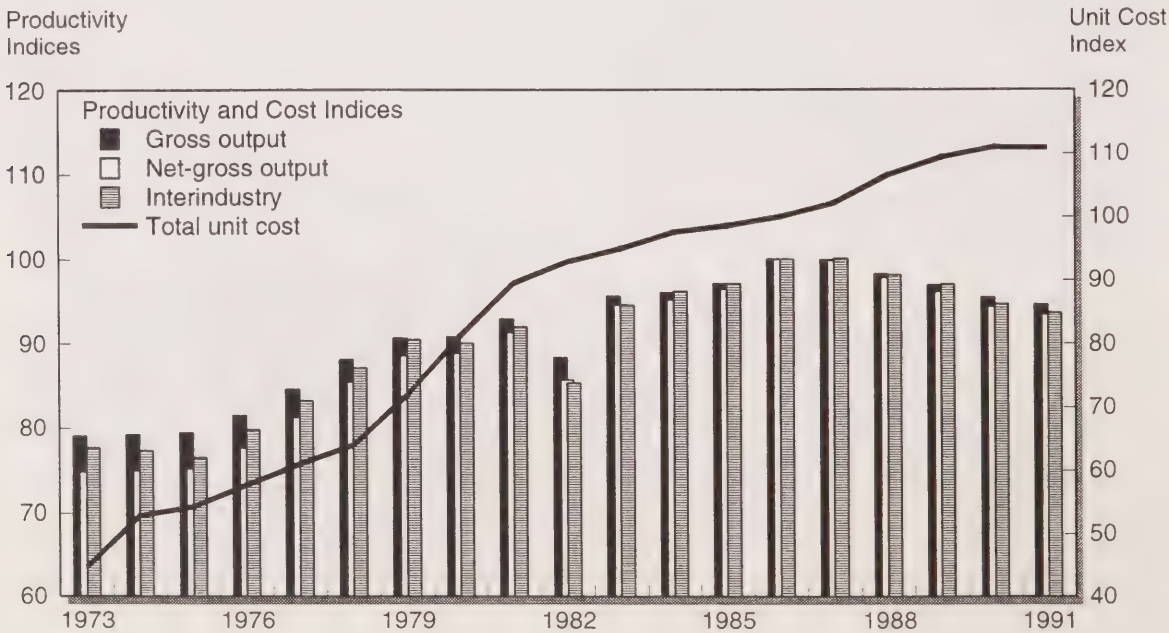


Table 17

Indices of multifactor productivity, partial productivity and total unit cost, clothing industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	86.4	78.9	73.9	91.1	95.0	100.6	85.9	78.5	43.8
1974	86.5	69.7	74.7	95.8	94.8	104.8	86.0	78.6	49.6
1975	87.9	72.4	77.7	104.0	92.9	109.8	87.4	79.7	53.1
1976	90.2	78.4	81.7	109.2	94.6	106.6	89.9	82.9	57.1
1977	92.2	78.3	85.5	108.4	95.1	108.9	91.8	85.7	60.8
1978	95.6	86.9	90.1	93.6	98.2	107.1	95.4	90.3	65.0
1979	97.6	92.1	92.7	108.6	101.0	103.7	97.5	93.4	72.8
1980	97.4	88.5	93.1	98.3	101.3	103.0	97.2	93.3	79.6
1981	98.3	83.0	93.9	104.3	103.6	105.2	98.2	95.0	85.8
1982	95.6	73.5	91.3	103.8	102.9	102.9	95.4	89.9	91.0
1983	94.6	82.1	89.6	101.0	98.6	103.4	94.3	91.6	94.2
1984	97.2	87.8	92.2	99.1	101.5	103.5	97.1	95.2	96.2
1985	98.7	91.1	95.9	101.0	102.7	100.0	98.6	97.3	97.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.6	101.2	102.0	109.6	100.8	97.3	100.6	100.8	103.2
1988	98.5	93.0	100.7	104.3	100.0	95.2	98.5	98.1	105.7
1989	98.8	89.0	107.0	120.8	95.0	97.6	98.7	98.0	109.0
1990	97.8	77.7	108.3	100.5	96.5	96.4	97.7	95.9	112.0
1991	97.4	68.9	107.5	90.3	100.0	96.1	97.2	94.9	113.2

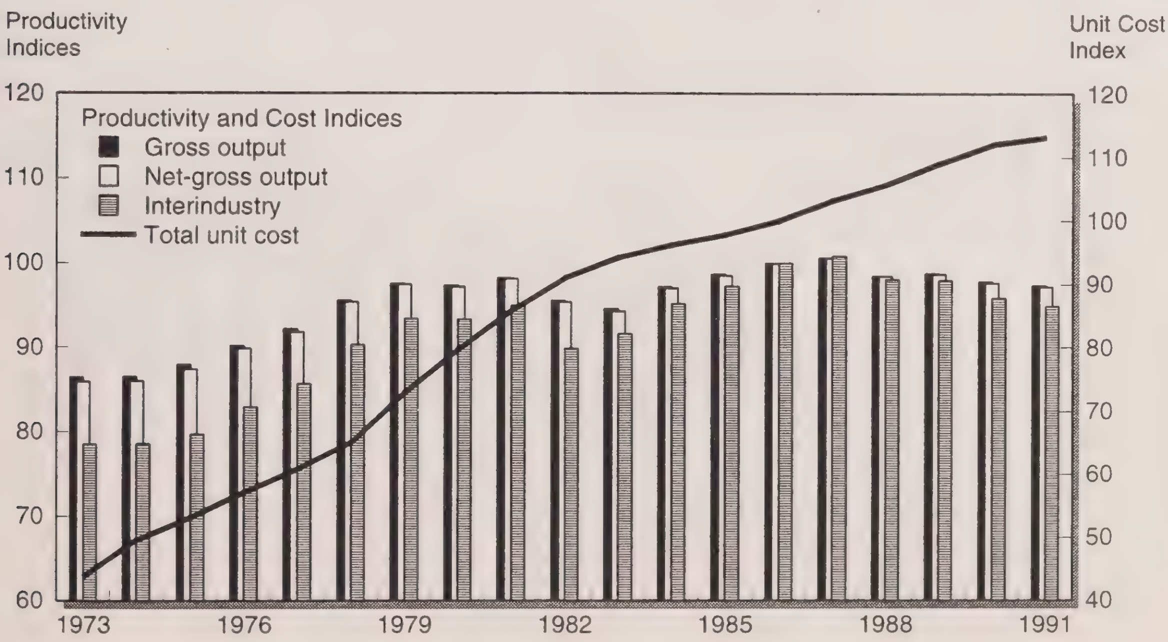


Table 18

Indices of multifactor productivity, partial productivity and total unit cost, wood industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	82.5	65.8	63.2	86.4	90.5	104.3	80.9	69.5	48.7
1974	82.7	54.5	66.0	88.4	93.7	104.2	81.2	70.0	49.0
1975	81.2	45.7	66.0	85.0	94.1	100.7	79.4	66.4	51.6
1976	84.2	53.9	71.2	89.4	92.7	104.8	82.8	71.1	57.5
1977	86.8	56.4	73.9	90.2	95.9	105.1	85.6	74.3	64.2
1978	85.7	59.5	72.2	86.0	95.1	99.6	84.5	73.5	75.1
1979	85.6	60.4	72.6	83.3	95.3	96.4	84.3	74.0	86.1
1980	88.6	58.9	76.7	84.9	100.4	95.9	87.7	78.0	82.2
1981	90.4	57.4	82.2	84.7	100.2	96.5	89.5	79.4	84.3
1982	89.5	49.3	83.5	82.9	98.4	94.7	88.6	78.1	84.4
1983	93.1	68.4	90.9	92.5	96.0	101.4	92.4	85.6	92.6
1984	96.9	80.6	94.9	94.6	98.9	104.1	96.7	93.8	91.0
1985	100.1	92.5	98.2	98.5	103.1	101.0	100.1	98.2	93.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.6	110.2	104.2	108.7	99.0	103.1	102.8	105.4	103.9
1988	101.0	102.0	105.0	109.2	97.1	102.6	101.1	105.0	104.6
1989	99.0	84.7	106.9	111.8	95.3	102.1	98.9	103.3	107.7
1990	97.4	71.3	109.2	105.6	93.0	102.6	97.1	100.7	106.7
1991	97.0	64.1	109.9	95.3	93.0	103.3	96.6	98.6	105.1

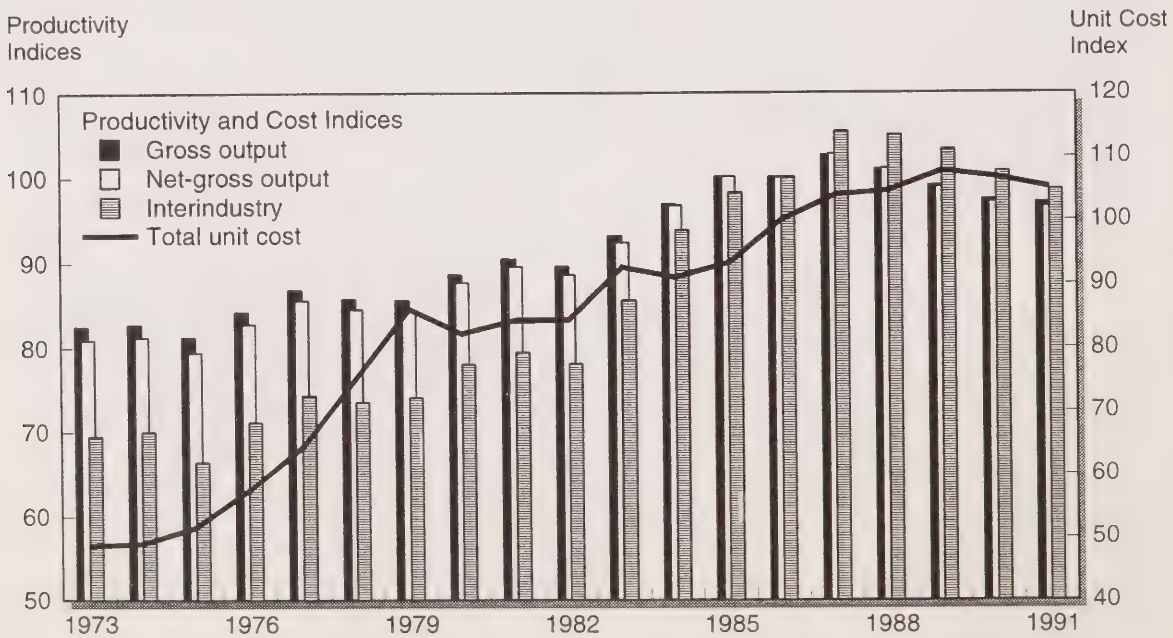


Table 19

Indices of multifactor productivity, partial productivity and total unit cost, furniture & fixture industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	105.7	89.1	91.3	91.3	121.4	120.2	105.9	100.6	34.2
1974	96.6	78.7	85.7	93.4	109.4	109.9	96.5	91.6	41.1
1975	95.2	66.0	81.1	86.2	116.0	107.9	95.1	88.2	45.3
1976	100.2	71.3	89.2	92.7	117.5	111.1	100.2	94.4	47.6
1977	101.2	69.1	91.1	89.6	119.4	110.6	101.3	96.0	50.9
1978	105.3	77.2	94.6	96.7	123.8	111.6	105.5	100.6	54.5
1979	102.8	85.4	89.4	97.2	120.5	109.5	102.9	99.0	61.7
1980	101.5	86.4	90.7	92.4	118.5	101.2	101.6	97.5	69.0
1981	102.8	94.6	96.0	95.7	113.1	103.0	102.9	99.1	77.2
1982	93.1	69.1	86.0	87.5	109.6	91.9	92.9	87.1	85.0
1983	98.9	77.9	98.2	94.9	108.4	96.8	98.9	95.5	88.4
1984	101.0	89.4	100.2	95.4	107.2	98.3	101.1	99.8	92.6
1985	102.0	97.5	98.6	98.1	106.3	101.7	102.1	101.8	95.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	95.3	93.7	94.0	97.1	95.7	98.0	95.1	95.9	104.2
1988	92.7	84.2	94.1	85.9	94.4	91.5	92.4	93.1	108.3
1989	92.5	82.4	98.4	88.0	92.3	88.9	92.2	92.7	113.0
1990	91.3	76.3	94.0	82.0	94.7	89.1	91.0	90.3	116.6
1991	89.1	66.3	92.7	74.1	95.4	85.1	88.6	87.4	116.6

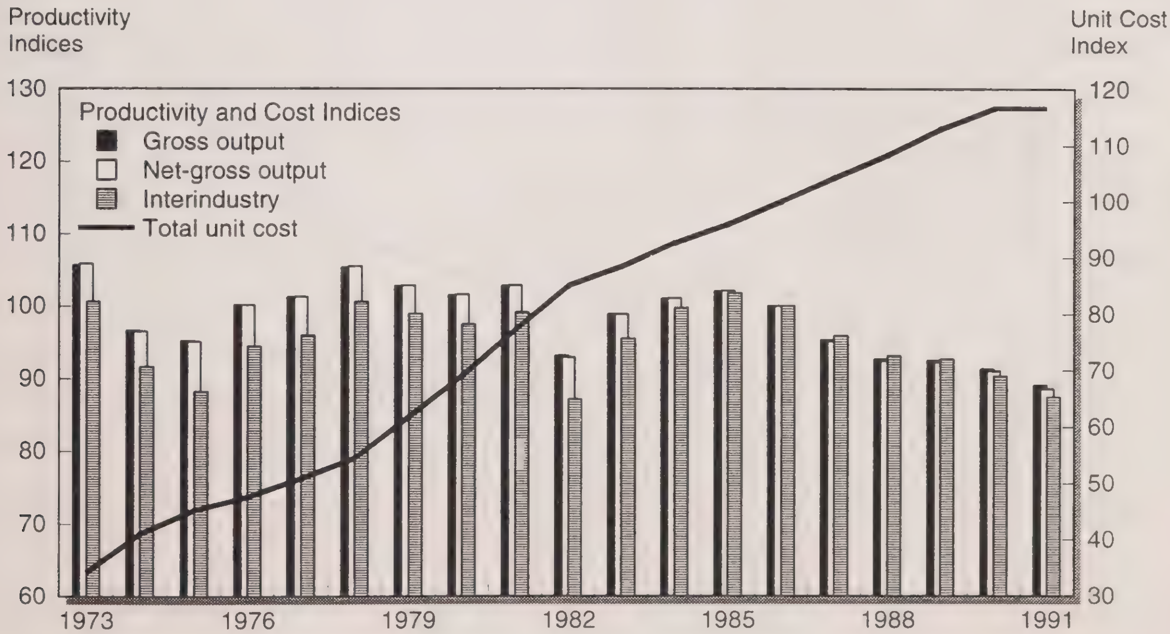


Table 20

Indices of multifactor productivity, partial productivity and total unit cost, paper & allied products industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	101.3	101.6	76.8	94.9	114.5	119.0	101.6	95.5	31.7
1974	103.3	113.3	78.8	87.1	114.1	117.4	103.9	97.2	42.7
1975	92.6	89.0	70.8	80.9	109.0	103.4	91.7	83.0	50.3
1976	98.6	103.5	74.8	82.4	113.3	109.9	98.4	91.2	51.5
1977	98.4	102.9	75.1	81.1	112.3	112.3	98.2	91.5	54.7
1978	100.3	111.1	76.2	84.6	112.5	112.8	100.3	93.5	56.9
1979	101.2	117.1	82.6	83.0	109.0	108.5	101.4	95.4	67.5
1980	100.1	120.5	79.0	87.2	106.5	107.0	100.1	93.7	77.6
1981	99.8	110.9	82.8	89.6	106.8	106.0	99.7	93.2	85.4
1982	94.1	87.3	81.0	91.3	103.3	99.4	93.3	85.5	88.2
1983	98.4	89.8	89.5	95.4	104.3	106.2	98.1	92.9	85.4
1984	99.6	99.6	93.3	91.9	103.8	102.8	99.5	97.4	94.4
1985	99.7	103.8	96.0	95.1	101.0	101.5	99.7	98.5	96.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.3	100.7	103.4	102.9	101.5	97.3	101.5	103.3	109.2
1988	99.7	94.3	103.8	98.2	102.3	94.1	99.6	101.7	119.1
1989	94.9	79.0	101.8	97.5	102.3	88.0	94.2	95.6	122.3
1990	91.2	61.3	103.6	91.8	103.6	87.2	90.0	90.1	117.7
1991	91.3	56.4	107.3	87.6	105.3	86.6	90.1	89.3	106.2

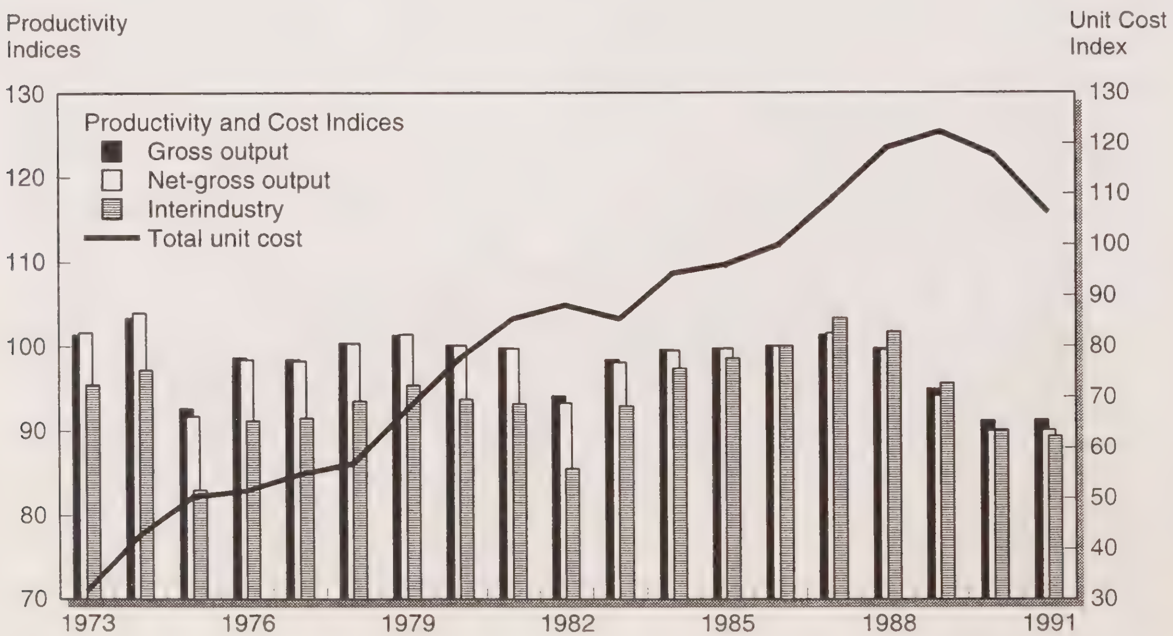


Table 21

Indices of multifactor productivity, partial productivity and total unit cost, printing, publishing & allied industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	90.1	84.9	73.7	77.5	87.4	155.2	89.5	87.1	36.1
1974	89.8	84.7	74.1	81.9	86.9	151.8	89.2	86.9	41.9
1975	90.9	86.2	75.5	88.8	89.5	143.2	90.3	85.4	46.5
1976	95.7	93.2	82.2	96.7	89.9	148.8	95.5	92.1	48.6
1977	99.1	97.0	87.6	96.6	90.2	151.0	99.0	95.5	51.1
1978	101.0	105.0	89.5	98.9	89.5	152.6	101.1	98.1	54.2
1979	100.6	105.8	88.9	101.8	89.3	149.7	100.6	98.4	60.2
1980	100.5	108.2	89.9	101.4	86.8	150.6	100.5	98.0	66.7
1981	101.2	101.4	94.1	103.3	87.2	150.0	101.3	98.7	74.4
1982	96.5	91.4	90.2	104.6	89.5	128.4	96.3	91.8	81.7
1983	98.9	94.7	94.3	106.3	94.2	119.0	98.8	96.5	86.6
1984	101.4	103.4	98.7	101.5	97.0	110.9	101.5	100.7	91.6
1985	101.2	100.3	100.6	104.7	101.3	102.8	101.3	100.9	96.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	97.6	96.1	98.1	100.4	96.2	99.7	97.4	98.2	105.5
1988	97.2	95.8	98.5	95.6	92.2	103.0	96.9	97.5	111.7
1989	95.8	91.3	95.9	101.5	91.9	104.8	95.5	95.0	118.3
1990	92.5	78.5	91.9	99.8	95.1	103.7	91.9	90.2	124.6
1991	87.9	63.5	90.6	84.8	94.0	101.4	86.9	85.1	127.7

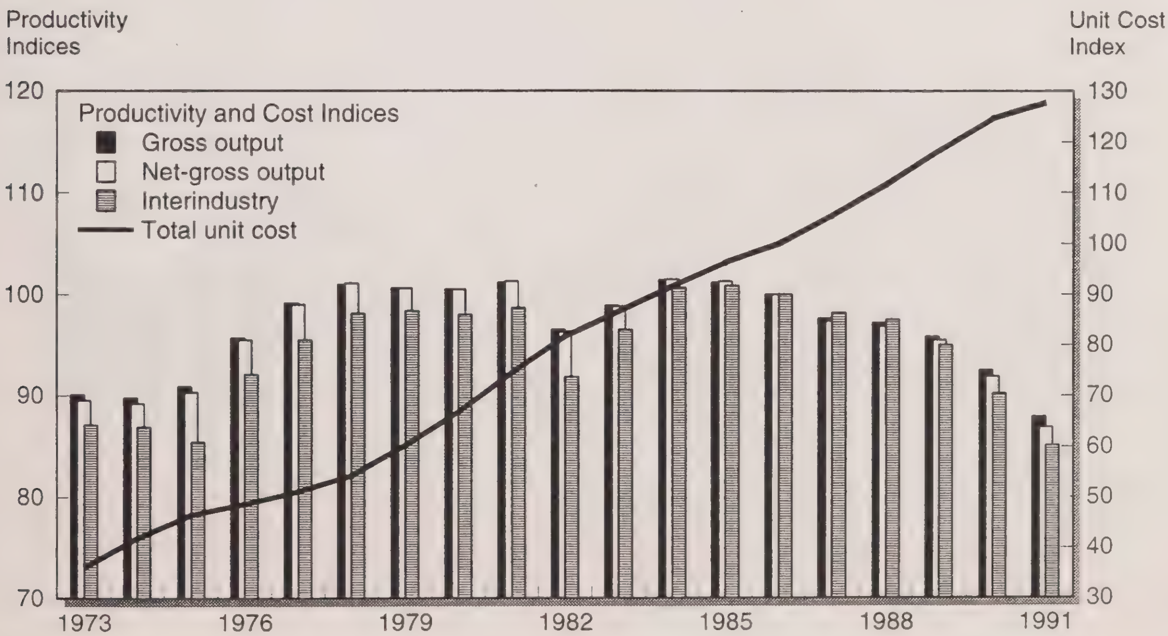


Table 22

Indices of multifactor productivity, partial productivity and total unit cost, primary metal industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	97.2	124.5	77.8	96.8	100.3	123.5	96.6	93.2	36.0
1974	97.9	129.3	79.1	96.6	100.4	123.7	97.4	88.8	44.3
1975	95.7	106.5	74.2	90.6	103.3	116.0	94.9	85.1	49.7
1976	93.3	95.5	74.4	89.8	100.3	114.4	92.1	84.8	53.8
1977	96.3	97.6	74.7	89.9	106.7	110.9	95.6	87.4	58.3
1978	97.7	102.4	77.3	87.2	107.8	108.9	97.1	90.7	63.8
1979	94.0	106.8	74.9	88.8	102.6	100.4	92.9	86.5	78.4
1980	92.0	112.5	76.8	87.2	96.6	99.0	90.7	85.5	89.4
1981	94.9	105.4	79.9	91.1	100.7	102.2	93.9	85.1	91.4
1982	89.7	77.5	72.3	88.5	99.0	97.1	88.0	81.3	91.7
1983	94.5	82.8	83.9	95.4	99.2	102.6	93.6	87.2	95.1
1984	97.8	102.4	90.8	99.9	98.4	104.8	97.4	96.1	99.4
1985	100.9	107.0	99.7	104.8	99.3	104.3	101.1	100.8	98.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.4	103.2	107.3	101.2	101.2	98.5	102.8	106.7	105.3
1988	102.3	105.8	105.4	95.6	102.4	95.5	102.7	107.2	124.0
1989	102.4	103.7	110.4	94.8	102.7	90.8	102.8	104.0	125.2
1990	99.8	86.9	108.4	90.3	101.2	93.7	99.9	100.0	113.3
1991	100.4	80.3	115.1	81.8	101.0	94.7	100.5	102.1	103.3

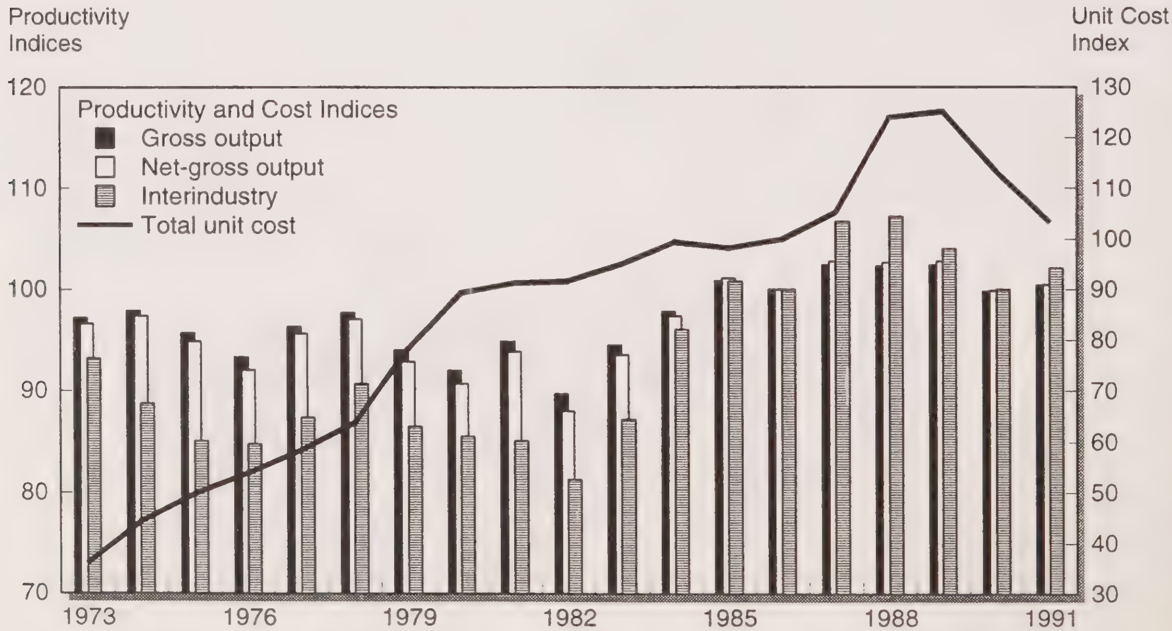


Table 23

Indices of multifactor productivity, partial productivity and total unit cost, fabricated metal products industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	96.1	96.2	83.2	85.7	101.3	111.6	95.8	95.9	36.5
1974	97.6	101.5	86.4	91.0	100.4	111.4	97.5	96.9	43.6
1975	94.1	90.5	81.3	89.0	101.5	105.7	93.7	91.0	49.4
1976	95.9	92.9	84.1	90.6	102.3	107.2	95.6	93.1	53.0
1977	96.4	91.9	84.7	86.9	103.9	105.5	96.2	94.1	56.6
1978	96.7	97.5	85.4	90.3	102.8	103.7	96.5	94.7	61.9
1979	94.2	106.7	89.6	92.6	92.0	105.7	93.8	92.2	70.2
1980	95.3	101.7	89.3	89.5	95.7	105.2	95.0	91.9	79.8
1981	97.1	92.8	91.2	95.9	100.0	107.1	97.0	93.7	83.9
1982	95.1	80.5	91.1	95.6	99.2	105.5	94.7	88.6	88.3
1983	96.6	81.1	92.7	91.9	102.1	102.9	96.3	93.2	91.6
1984	99.8	94.8	98.6	91.1	101.4	102.9	99.8	99.8	94.5
1985	101.3	103.4	101.5	101.4	99.7	103.8	101.4	102.4	97.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.4	98.7	101.2	98.7	97.2	104.4	99.4	100.0	103.8
1988	99.0	101.2	96.9	91.2	99.5	100.2	98.9	98.7	108.0
1989	98.9	106.0	95.2	92.2	99.2	99.9	98.8	98.7	111.0
1990	99.1	99.6	94.9	85.7	101.4	101.2	99.0	97.3	111.7
1991	97.9	95.1	93.4	73.8	102.2	98.8	97.7	95.7	110.7

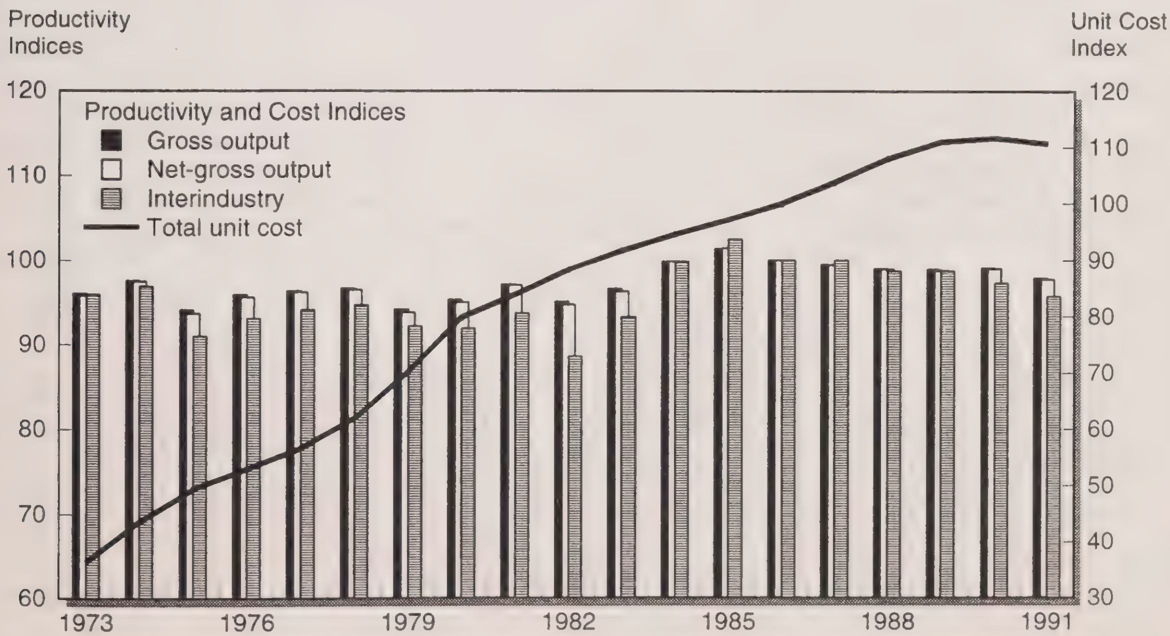


Table 24

Indices of multifactor productivity, partial productivity and total unit cost, machinery industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	98.5	129.8	90.2	88.7	96.6	104.7	98.4	97.8	33.1
1974	100.0	134.1	92.4	99.0	97.3	104.2	100.0	99.3	38.7
1975	96.5	124.9	87.7	98.3	97.5	96.0	96.4	94.1	44.9
1976	97.1	111.8	88.3	90.2	101.7	94.7	97.0	95.3	48.3
1977	99.0	110.4	91.7	90.1	102.4	99.1	99.0	97.7	51.7
1978	100.9	117.8	93.4	90.0	103.2	99.6	100.9	99.4	57.1
1979	104.4	137.1	100.5	102.2	99.8	103.3	104.6	103.4	64.0
1980	102.9	134.0	98.1	98.6	99.2	102.4	103.1	101.1	72.2
1981	100.5	113.1	98.1	100.9	99.3	102.6	100.5	99.1	81.1
1982	92.8	80.1	89.2	88.5	99.1	100.0	92.4	89.0	89.6
1983	91.5	68.4	87.5	85.4	102.3	97.5	91.0	89.1	91.3
1984	98.4	85.6	96.9	88.8	103.3	102.2	98.3	97.5	95.1
1985	99.7	96.1	99.1	93.5	101.7	98.6	99.7	99.6	97.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	97.5	105.0	97.1	91.2	96.4	95.9	97.4	97.9	101.5
1988	99.0	117.4	98.5	97.9	96.1	93.5	98.9	99.6	107.2
1989	97.9	116.7	99.2	99.5	94.8	89.5	97.8	98.6	112.0
1990	96.2	99.6	101.0	92.9	96.2	85.7	96.0	96.1	115.1
1991	91.1	77.4	94.7	72.8	95.6	87.0	90.7	90.4	115.9

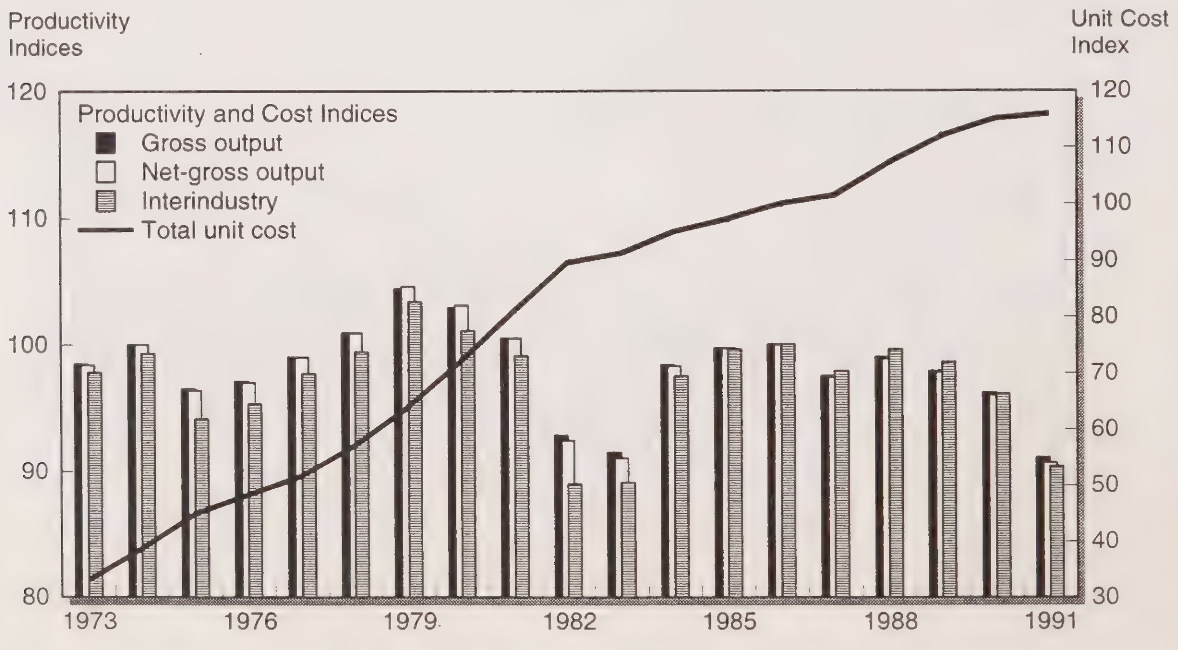


Table 25

Indices of multifactor productivity, partial productivity and total unit cost, transportation equipment industries (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	94.7	134.8	79.6	76.0	98.8	106.9	94.2	92.9	32.9
1974	95.5	136.0	83.2	80.1	99.8	99.8	95.1	93.6	36.2
1975	97.3	123.7	86.5	84.8	102.0	104.8	97.1	94.4	40.3
1976	98.6	135.9	91.8	90.0	100.6	106.3	98.4	96.3	43.3
1977	99.3	150.9	92.5	88.6	100.4	106.2	99.2	97.3	47.7
1978	99.6	155.2	94.2	96.2	100.2	103.6	99.5	97.7	53.4
1979	99.4	144.1	91.3	94.5	103.7	94.6	99.3	97.9	58.9
1980	93.8	103.2	83.8	82.9	102.3	84.9	93.4	91.7	65.8
1981	95.2	69.4	84.4	84.6	107.6	85.5	94.8	93.3	75.0
1982	94.2	59.0	88.6	85.9	105.6	85.4	93.7	90.8	81.3
1983	96.7	72.9	98.2	93.9	100.5	100.4	96.5	95.0	85.4
1984	100.1	93.0	105.6	103.1	100.0	99.8	100.2	99.8	90.4
1985	101.3	107.0	104.3	107.9	99.4	101.9	101.3	101.4	95.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	98.3	86.3	95.0	92.7	99.8	104.6	98.2	98.5	100.0
1988	99.8	89.2	110.4	102.9	96.4	110.2	99.8	100.4	99.0
1989	100.4	81.3	113.9	102.0	97.1	113.9	100.4	100.8	101.7
1990	98.8	72.6	114.1	96.7	96.5	112.5	98.7	98.2	103.6
1991	98.2	70.3	114.5	91.1	95.7	114.0	98.0	97.2	106.2

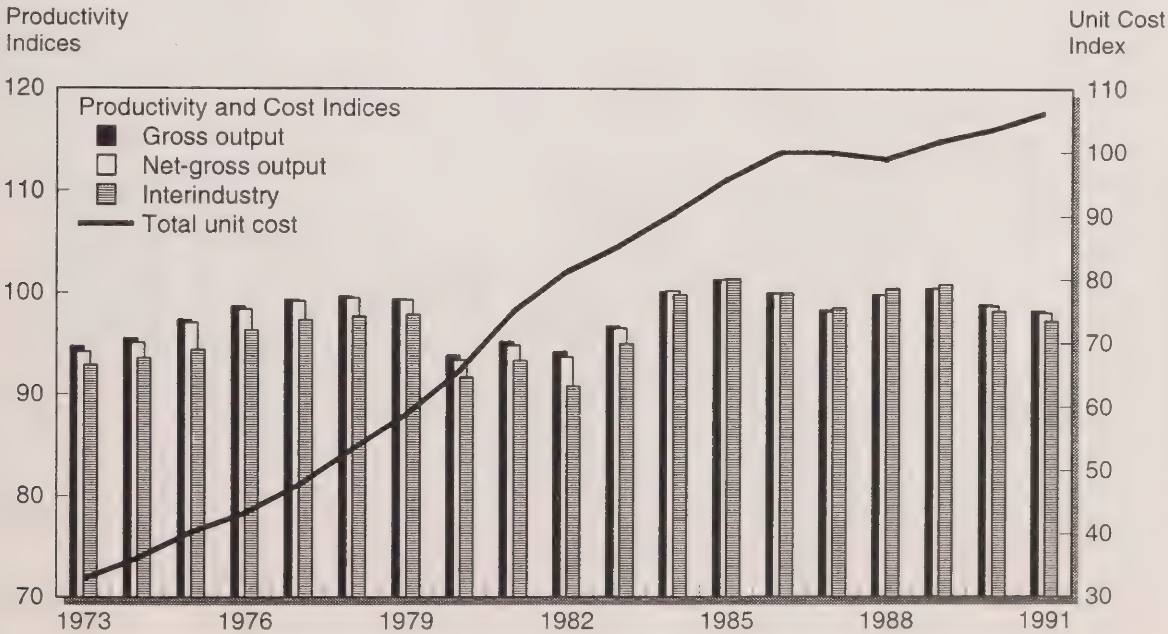


Table 26

Indices of multifactor productivity, partial productivity and total unit cost, electrical & electronic products industries (1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	80.2	104.3	53.0	57.7	99.2	79.0	78.6	73.9	50.5
1974	80.0	105.2	54.1	64.5	97.2	78.2	78.4	74.2	58.0
1975	78.6	93.8	52.6	58.8	98.8	76.8	76.9	72.0	64.6
1976	81.8	97.9	56.5	60.6	100.9	78.5	80.3	76.0	67.2
1977	84.6	97.0	60.6	60.5	103.8	79.1	83.4	78.8	70.1
1978	83.7	103.6	60.7	64.1	99.5	78.0	82.5	77.8	75.6
1979	89.7	124.7	66.5	72.0	102.2	81.4	88.9	85.4	82.5
1980	93.3	132.7	69.9	74.0	105.1	82.9	92.8	90.1	87.3
1981	94.3	130.3	73.5	77.1	103.5	86.8	93.9	91.4	92.7
1982	90.9	99.6	70.1	78.0	107.2	88.4	90.2	87.5	99.5
1983	91.1	93.9	74.2	81.4	104.6	90.1	90.5	88.5	101.1
1984	97.4	101.8	85.2	87.0	106.3	93.7	97.2	97.2	100.0
1985	98.7	101.3	92.0	95.6	102.5	98.7	98.6	98.6	100.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.9	104.1	103.2	89.6	98.2	102.2	100.9	101.5	100.3
1988	103.1	110.8	113.8	115.8	94.4	105.4	103.3	104.4	100.9
1989	104.6	113.4	120.4	125.0	91.8	113.9	105.0	106.2	101.5
1990	105.9	113.7	133.3	128.6	88.0	120.2	106.4	107.3	100.0
1991	104.5	111.0	140.5	130.5	84.1	119.4	104.9	106.4	97.5

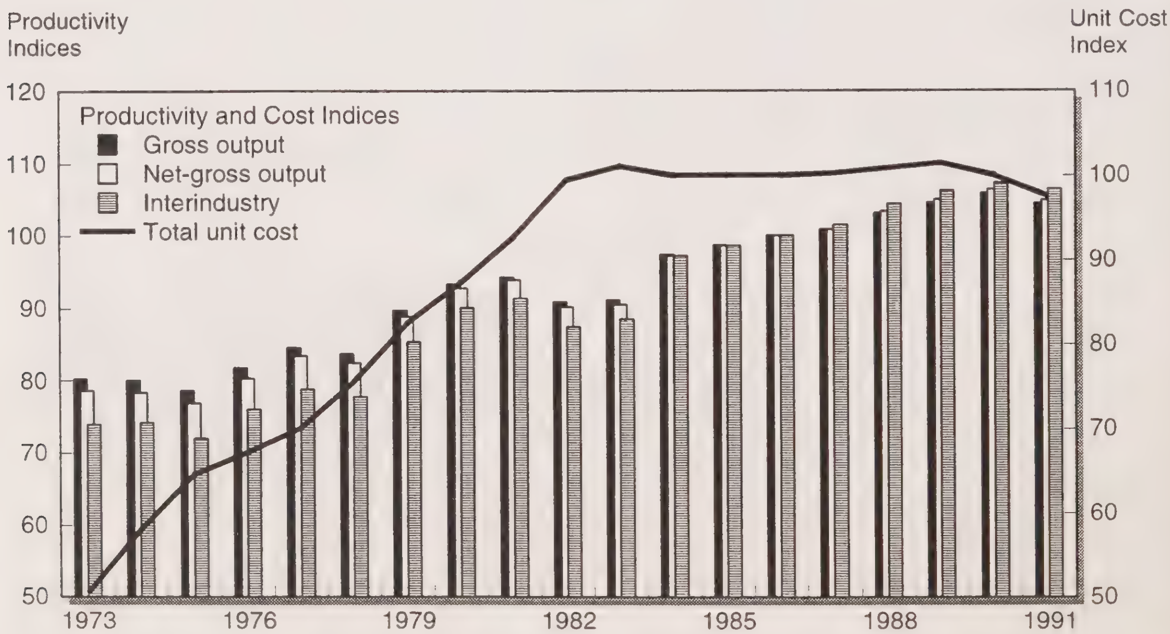


Table 27

Indices of multifactor productivity, partial productivity and total unit cost, non-metallic mineral products industries(1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	100.4	98.1	85.5	82.2	111.4	115.9	100.7	94.3	31.3
1974	96.7	84.7	87.1	76.4	110.9	110.8	96.5	93.5	36.1
1975	94.0	76.6	85.2	82.3	109.9	108.3	93.4	90.6	42.4
1976	95.0	76.3	88.5	82.3	109.7	109.7	94.6	93.5	46.5
1977	94.1	72.1	90.5	82.0	107.6	109.8	93.6	91.9	50.2
1978	95.6	73.6	93.3	81.0	109.6	108.8	95.2	94.7	54.3
1979	96.0	76.2	97.0	77.3	107.5	107.1	95.7	95.8	59.3
1980	90.9	65.6	92.0	78.5	104.5	102.5	90.0	88.8	66.6
1981	90.5	64.7	91.2	84.0	103.9	100.6	89.5	86.9	76.9
1982	85.1	53.2	85.6	83.6	101.8	94.6	83.5	79.7	86.5
1983	90.3	62.7	90.0	91.4	103.0	101.1	89.2	87.8	90.2
1984	94.5	76.0	93.8	92.0	103.8	101.9	94.0	94.4	92.5
1985	98.4	88.7	97.8	99.4	103.6	100.3	98.2	97.6	95.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.0	107.0	101.6	109.4	98.2	101.8	102.2	104.6	103.8
1988	101.8	105.2	100.8	101.9	101.9	98.7	102.0	105.5	107.7
1989	99.6	98.4	102.0	108.4	98.5	96.8	99.5	102.2	109.3
1990	94.5	81.1	98.3	98.6	99.6	94.3	93.9	95.9	111.7
1991	90.1	65.5	94.6	93.7	100.4	94.1	89.1	91.6	110.2

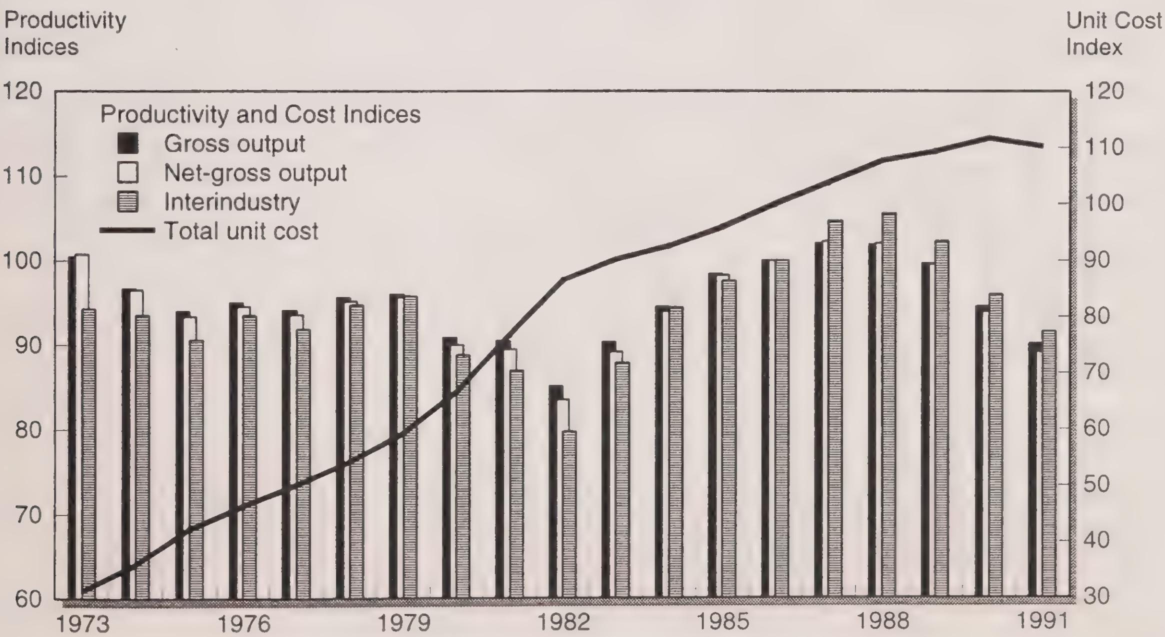


Table 28

Indices of multifactor productivity, partial productivity and total unit cost, refined petroleum & coal products (1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	96.3	125.4	103.6	213.5	92.7	132.9	96.2	137.8	19.5
1974	95.8	119.5	98.3	197.5	92.5	134.3	95.7	133.8	35.8
1975	96.4	106.9	101.0	178.7	93.7	132.9	96.4	127.4	45.5
1976	95.9	102.5	103.3	173.2	93.6	127.3	95.8	122.0	47.8
1977	98.8	112.4	105.4	164.2	96.9	125.1	98.8	123.2	52.8
1978	96.7	113.6	91.1	159.0	95.0	126.0	96.6	114.4	59.1
1979	95.3	125.5	103.6	148.2	93.5	117.1	95.2	114.5	71.1
1980	95.8	131.0	98.7	152.8	94.4	111.6	95.7	106.4	97.3
1981	97.9	134.2	82.6	140.3	97.4	110.9	97.8	102.5	133.8
1982	100.2	104.1	75.6	132.7	101.1	104.8	100.2	101.4	151.8
1983	101.6	89.4	81.2	115.8	103.3	103.4	101.6	103.5	158.8
1984	102.2	88.5	89.5	106.7	104.2	97.4	102.2	105.1	165.7
1985	101.0	92.4	88.1	86.0	102.8	100.0	101.1	104.4	158.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.7	112.5	104.3	91.6	100.2	100.0	100.8	104.6	104.0
1988	101.1	112.9	104.8	95.2	100.4	100.0	101.1	109.8	90.4
1989	100.8	113.2	95.3	85.6	100.3	104.9	100.8	108.1	96.3
1990	101.2	108.3	106.7	88.7	99.6	107.2	101.2	109.8	114.6
1991	101.1	99.5	111.5	45.1	101.1	107.3	101.2	111.4	109.7

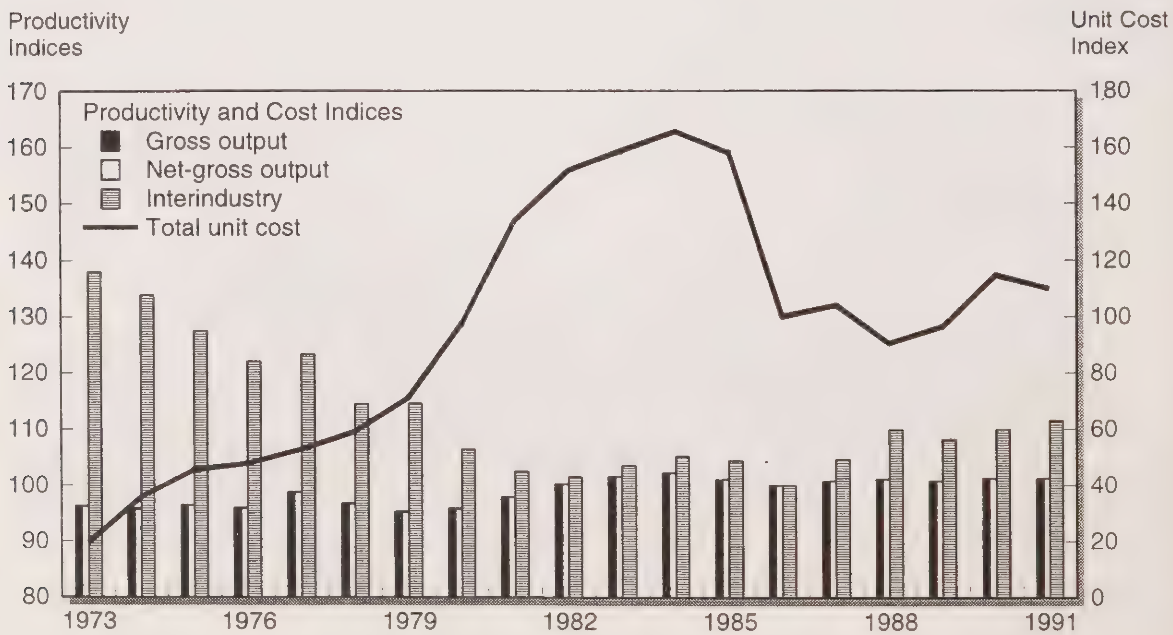


Table 29

Indices of multifactor productivity, partial productivity and total unit cost, chemical & chemical products industries(1986=100)

Year	Industry productivity on gross output: Total	Partial: Capital	Partial: Labour	Partial: Energy	Partial: Raw material	Partial: Services	Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
1973	91.1	114.7	59.5	86.5	100.0	92.9	89.4	91.1	34.8
1974	91.1	119.8	60.6	87.7	98.4	91.0	89.4	91.4	44.5
1975	86.1	104.1	56.2	94.0	95.9	86.7	83.7	85.5	52.1
1976	89.7	98.5	63.2	91.4	99.9	90.3	87.8	89.9	54.6
1977	89.2	93.7	62.5	95.0	99.6	92.5	87.2	90.5	57.3
1978	91.6	98.1	69.6	98.1	97.7	95.8	89.9	92.6	61.1
1979	93.7	104.6	76.8	102.3	95.8	97.6	92.4	95.2	70.1
1980	91.2	103.1	78.5	95.7	92.6	91.8	89.5	91.3	81.6
1981	94.0	105.6	79.7	92.5	96.5	94.3	92.9	94.8	93.3
1982	88.9	80.8	74.8	102.0	94.5	91.9	86.7	87.7	99.0
1983	95.6	79.5	86.2	108.4	102.7	99.6	94.6	94.1	96.4
1984	98.6	87.4	92.7	97.5	104.5	101.2	98.3	98.4	99.3
1985	99.6	94.8	97.7	98.7	101.6	101.8	99.5	100.2	101.5
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.7	103.0	103.8	107.0	99.4	102.5	102.0	102.6	103.4
1988	103.0	103.5	99.0	119.8	104.5	99.1	103.7	103.9	114.9
1989	104.4	105.5	100.9	113.2	104.9	102.6	105.3	104.9	117.5
1990	102.9	98.7	100.2	108.3	104.1	106.9	103.5	102.3	115.5
1991	99.4	84.1	96.4	109.4	106.7	104.6	99.3	97.8	115.3

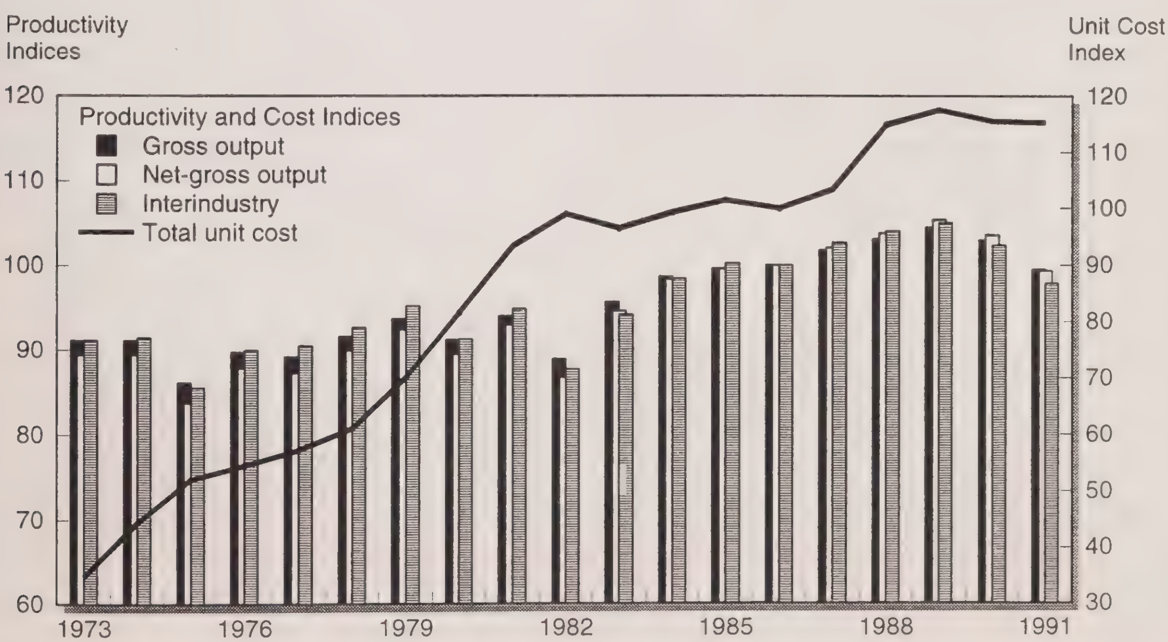
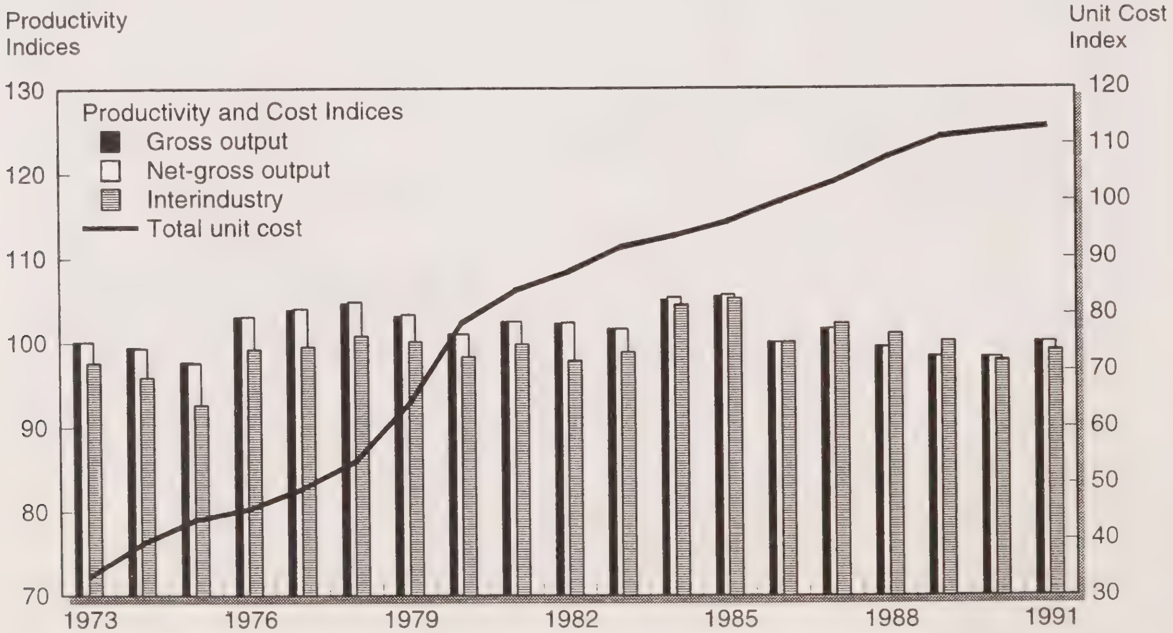


Table 30

Indices of multifactor productivity, partial productivity and total unit cost, other manufacturing industries(1986=100)

Year	Industry productivity on gross output						Industry productivity on net-gross output	Inter-industry productivity	Total unit cost
	Total	Partial							
		Capital	Labour	Energy	Raw material	Services			
1973	100.1	121.1	91.2	95.7	96.8	119.9	100.1	97.6	33.3
1974	99.4	121.1	90.3	99.1	96.2	118.7	99.3	95.9	39.2
1975	97.7	109.5	86.6	103.8	97.9	118.2	97.6	92.7	43.5
1976	103.0	122.0	93.9	107.6	100.4	120.8	103.1	99.2	45.4
1977	103.8	116.8	98.1	108.9	100.5	119.7	104.0	99.5	49.0
1978	104.6	129.4	103.6	111.9	97.8	114.0	104.8	100.8	53.9
1979	103.1	122.5	99.2	109.8	100.2	109.7	103.3	100.1	64.1
1980	101.0	113.3	93.3	98.2	105.3	98.2	101.0	98.3	78.5
1981	102.4	110.1	94.4	102.1	107.1	100.9	102.5	99.8	84.2
1982	102.2	102.2	96.0	108.5	107.0	101.6	102.3	97.8	87.5
1983	101.6	103.9	94.8	103.6	105.4	103.5	101.6	98.8	91.9
1984	105.0	110.7	101.2	99.8	106.8	104.4	105.3	104.4	93.9
1985	105.4	112.2	102.4	113.6	105.1	106.5	105.6	105.2	96.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.5	87.3	103.0	100.5	102.6	104.0	101.6	102.2	103.4
1988	99.4	79.6	100.0	105.2	101.6	103.7	99.4	101.0	107.8
1989	98.3	78.6	95.7	109.5	100.3	109.4	98.3	100.1	111.3
1990	98.2	72.5	93.9	100.1	102.9	112.1	98.2	97.8	112.3
1991	100.0	70.5	97.7	90.2	104.6	113.8	100.0	99.0	113.1



PART 2

Labour Productivity

Labour Compensation

Unit Labour Cost

Table 1

Indices of labour productivity and unit labour cost, business sector industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	66.7	75.3	104.6	80.5	25.9	82.9	34.4	32.2	38.8
1974	69.0	79.0	103.9	83.9	30.7	82.2	38.9	36.7	44.6
1975	69.3	80.2	103.0	84.6	35.4	81.9	44.1	41.8	51.0
1976	74.0	81.5	102.5	85.3	40.7	86.8	50.0	47.7	55.0
1977	76.4	83.3	101.4	85.9	45.1	89.0	54.2	52.6	59.1
1978	78.9	85.9	102.1	88.8	49.2	88.9	57.3	55.3	62.3
1979	82.4	89.5	101.7	92.1	55.5	89.5	62.0	60.3	67.3
1980	83.8	91.4	101.5	93.4	62.7	89.8	68.6	67.2	74.8
1981	87.5	94.2	100.7	95.4	72.4	91.6	76.8	75.8	82.7
1982	82.6	91.3	99.0	90.9	75.8	90.9	83.0	83.4	91.8
1983	85.5	91.3	98.7	90.3	79.1	94.6	86.6	87.5	92.5
1984	91.5	93.7	99.5	93.4	85.9	98.0	91.7	92.0	93.9
1985	96.6	98.1	99.8	98.1	93.6	98.5	95.5	95.5	96.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.0	103.2	100.7	103.8	110.0	101.1	106.6	105.9	104.8
1988	110.1	107.2	101.1	108.1	121.7	101.9	113.5	112.6	110.5
1989	112.8	109.6	100.2	109.6	131.6	102.9	120.1	120.1	116.7
1990	111.1	109.9	100.0	109.7	137.2	101.3	124.9	125.1	123.5
1991	107.6	106.6	98.8	105.1	138.6	102.4	130.0	131.9	128.8
1992	107.9	105.4	98.6	103.6	141.0	104.1	133.7	136.0	130.7
1993	111.3	107.2	99.4	106.0	145.1	105.0	135.4	136.9	130.3

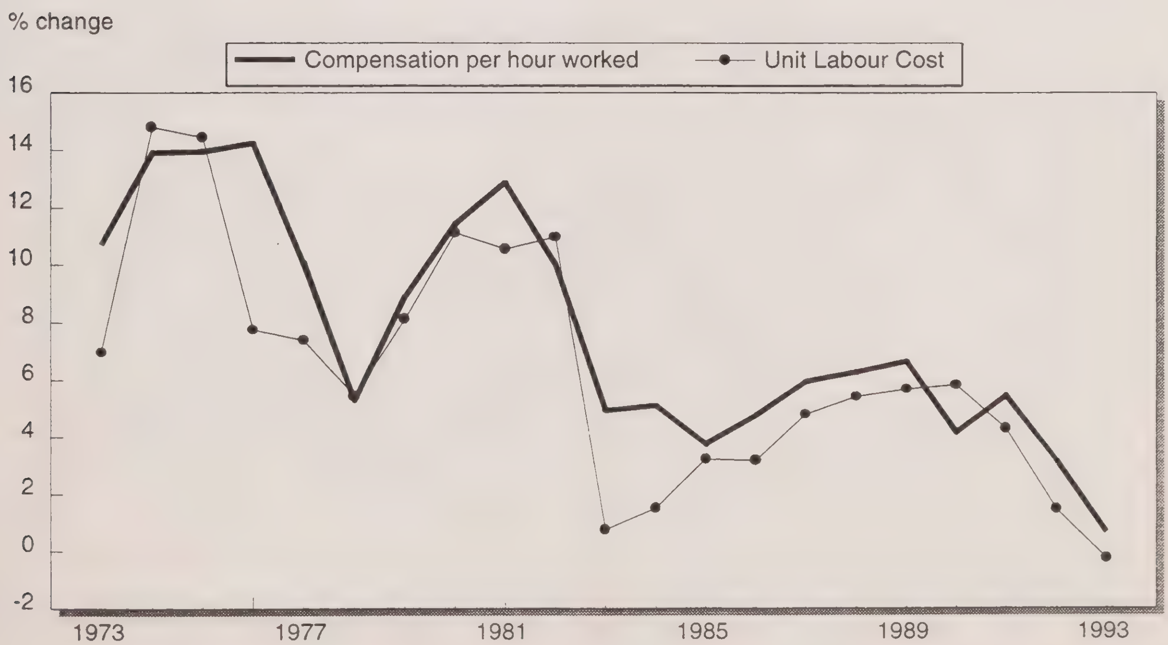


Table 2

Indices of labour productivity and unit labour cost, business sector-excluding agricultural & related services industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	66.3	74.2	104.6	78.6	25.8	84.4	34.7	32.8	38.8
1974	68.9	78.1	103.9	82.1	30.6	84.0	39.2	37.3	44.4
1975	68.9	79.0	102.9	82.3	35.2	83.7	44.6	42.8	51.1
1976	73.6	80.5	102.4	83.4	40.7	88.3	50.5	48.8	55.3
1977	76.1	82.5	101.4	84.4	45.1	90.1	54.7	53.4	59.3
1978	78.8	85.0	102.1	87.6	49.1	90.0	57.7	56.0	62.3
1979	82.6	88.8	101.5	90.8	55.5	90.9	62.5	61.1	67.2
1980	83.9	90.9	101.5	92.6	62.8	90.6	69.1	67.8	74.9
1981	87.4	93.8	100.7	94.7	72.3	92.3	77.1	76.3	82.7
1982	82.0	90.9	99.0	90.1	75.7	91.0	83.2	84.0	92.3
1983	85.2	90.6	98.7	89.5	79.0	95.2	87.1	88.2	92.7
1984	91.6	93.2	99.5	92.8	85.9	98.7	92.1	92.5	93.7
1985	97.1	97.9	99.8	97.7	93.5	99.4	95.6	95.7	96.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.5	103.5	100.7	104.3	110.3	101.1	106.5	105.7	104.5
1988	111.0	108.0	101.3	109.2	122.0	101.6	113.0	111.7	109.9
1989	113.4	110.6	100.3	111.0	132.1	102.2	119.4	119.0	116.4
1990	111.6	111.0	100.1	111.1	137.7	100.4	124.1	123.9	123.4
1991	107.9	107.4	98.8	106.1	139.0	101.7	129.4	131.0	128.8
1992	108.5	106.3	98.6	104.7	141.4	103.6	133.1	135.1	130.4
1993	111.8	108.1	99.5	107.2	145.5	104.3	134.6	135.8	130.1

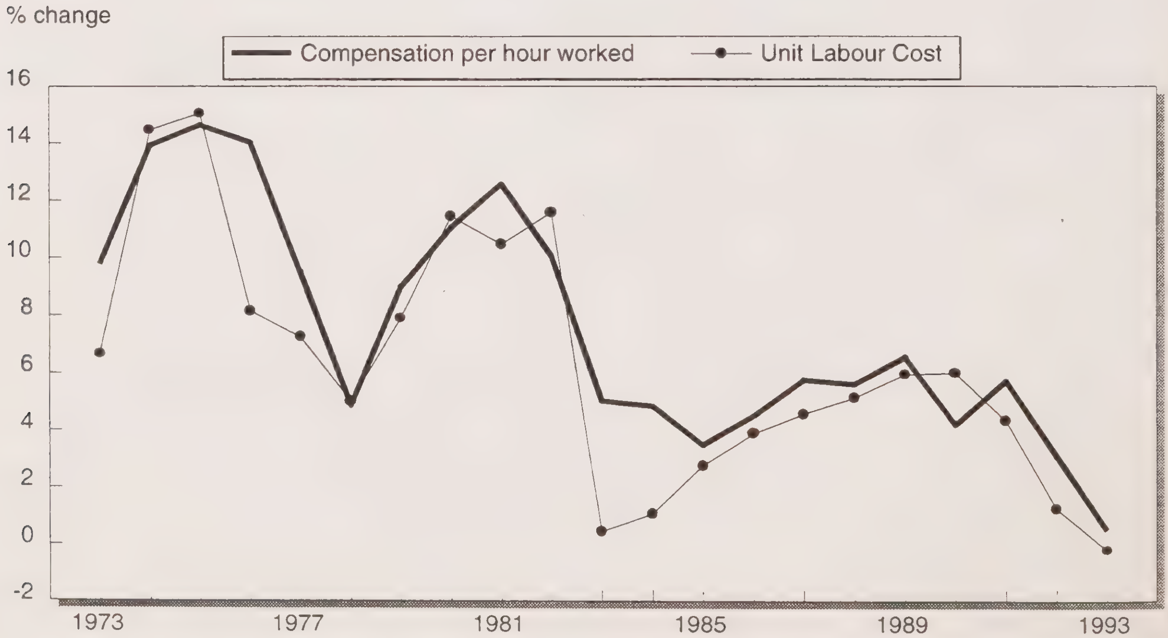


Table 3

Indices of labour productivity and unit labour cost, business sector-services (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	58.3	63.4	104.9	67.7	22.9	86.2	36.1	33.8	39.2
1974	61.8	67.7	104.2	71.7	27.4	86.1	40.4	38.1	44.3
1975	64.4	70.1	103.4	73.8	32.0	87.2	45.6	43.3	49.7
1976	68.0	71.6	102.6	74.7	37.0	91.0	51.6	49.4	54.4
1977	70.0	74.9	101.1	76.9	41.2	91.1	55.0	53.6	58.9
1978	73.7	78.1	102.1	80.8	45.2	91.2	57.9	55.9	61.3
1979	77.9	81.7	101.4	83.8	51.4	92.9	63.0	61.4	66.0
1980	81.3	84.9	101.5	86.8	59.0	93.7	69.5	68.0	72.5
1981	84.8	88.9	100.9	90.0	67.5	94.2	76.0	75.0	79.6
1982	81.0	88.5	99.3	88.2	73.3	91.9	82.9	83.1	90.5
1983	83.3	89.1	98.3	87.9	77.2	94.8	86.6	87.8	92.6
1984	89.2	92.3	99.1	91.7	84.9	97.3	91.9	92.6	95.2
1985	94.6	97.6	99.3	97.2	93.0	97.4	95.3	95.7	98.3
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.8	103.6	100.3	104.0	111.1	101.8	107.2	106.8	105.0
1988	111.6	107.7	100.8	108.3	122.7	103.0	114.0	113.3	110.0
1989	115.2	110.5	99.8	110.3	134.5	104.5	121.7	121.9	116.7
1990	114.4	112.7	99.9	112.6	142.4	101.6	126.4	126.4	124.4
1991	112.4	110.9	98.4	109.3	146.8	102.8	132.4	134.3	130.6
1992	114.2	111.1	98.1	109.2	151.7	104.6	136.5	139.0	132.9
1993	117.5	114.1	98.5	112.1	157.2	104.8	137.8	140.1	133.7

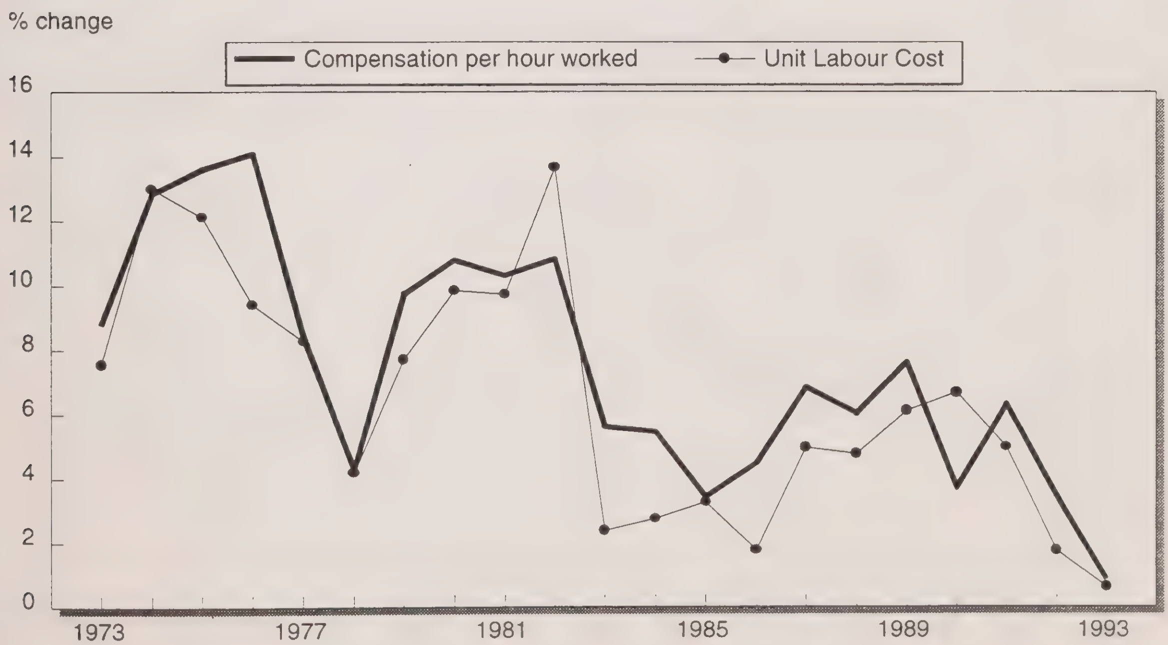


Table 4

Indices of labour productivity and unit labour cost, business sector-goods (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	76.2	94.3	102.5	98.9	29.8	77.0	31.6	30.2	39.1
1974	77.0	96.9	102.1	101.2	35.1	76.1	36.2	34.7	45.6
1975	74.6	96.3	101.2	100.0	39.7	74.6	41.2	39.7	53.2
1976	80.6	97.1	101.0	100.3	45.5	80.4	46.9	45.4	56.4
1977	83.5	96.7	100.6	98.8	50.2	84.5	51.9	50.8	60.1
1978	84.6	98.1	100.9	100.3	54.3	84.3	55.3	54.1	64.1
1979	87.3	101.9	100.9	104.0	60.7	83.9	59.6	58.4	69.6
1980	86.2	101.8	100.5	102.9	67.5	83.8	66.4	65.6	78.3
1981	90.0	102.7	99.7	103.2	78.5	87.2	76.5	76.1	87.3
1982	84.0	95.9	98.2	94.7	79.0	88.8	82.4	83.4	94.0
1983	87.5	94.6	99.0	93.8	81.5	93.3	86.1	86.9	93.1
1984	93.7	95.8	100.0	95.8	87.3	97.8	91.0	91.1	93.1
1985	98.5	98.8	100.5	99.4	94.5	99.0	95.6	95.0	95.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.1	102.6	101.4	103.6	108.6	100.4	105.9	104.8	104.4
1988	108.6	106.6	101.5	107.7	120.4	100.9	113.0	111.8	110.8
1989	110.1	108.1	100.9	108.6	128.0	101.4	118.5	117.9	116.3
1990	107.6	105.4	100.5	105.6	130.7	101.9	124.0	123.8	121.5
1991	102.5	99.7	99.9	99.1	128.0	103.4	128.5	129.2	125.0
1992	101.2	96.4	100.1	95.7	127.2	105.7	131.9	132.9	125.7
1993	104.7	96.2	101.9	97.1	129.6	107.7	134.7	133.4	123.9

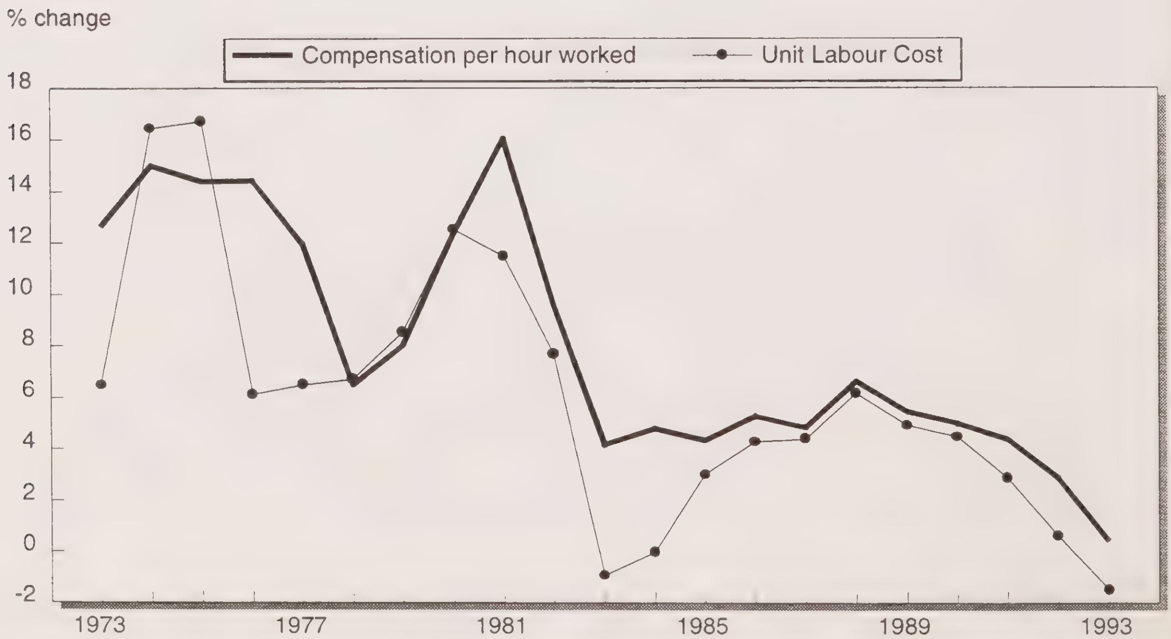


Table 5

Indices of labour productivity and unit labour cost, agricultural & related services industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	79.3	92.9	106.9	105.7	32.4	75.0	34.9	30.6	40.8
1974	69.6	94.1	107.5	107.5	35.3	64.8	37.6	32.9	50.8
1975	81.3	100.3	107.1	114.5	40.1	71.0	40.0	35.0	49.3
1976	88.5	97.9	107.0	110.3	41.8	80.2	42.7	37.9	47.3
1977	87.5	96.8	103.4	105.0	46.1	83.3	47.6	43.9	52.6
1978	83.8	99.1	101.8	105.8	53.5	79.2	54.0	50.6	63.9
1979	77.0	100.8	106.5	108.7	56.9	70.8	56.4	52.4	73.9
1980	81.5	100.3	101.4	103.9	60.3	78.5	60.2	58.0	74.0
1981	88.9	101.9	99.3	105.2	75.3	84.5	73.9	71.6	84.8
1982	94.5	97.5	100.7	101.0	80.0	93.5	82.1	79.2	84.7
1983	91.7	101.7	97.5	101.1	82.9	90.7	81.5	82.0	90.4
1984	88.8	101.5	98.2	100.9	88.6	88.0	87.3	87.8	99.8
1985	85.1	101.4	101.0	103.2	98.7	82.5	97.3	95.7	116.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	90.1	98.1	101.2	97.9	99.1	92.1	100.9	101.2	109.9
1988	85.5	95.4	95.2	92.7	109.8	92.2	115.2	118.5	128.5
1989	92.5	92.4	95.2	90.9	113.0	101.8	122.3	124.3	122.2
1990	98.0	92.2	95.7	92.1	119.9	106.5	130.0	130.2	122.3
1991	96.9	92.2	97.8	91.9	121.4	105.5	131.7	132.1	125.3
1992	89.8	91.4	97.6	89.6	122.1	100.3	133.6	136.3	135.9
1993	96.0	92.2	96.9	90.0	128.2	106.7	139.0	142.4	133.5

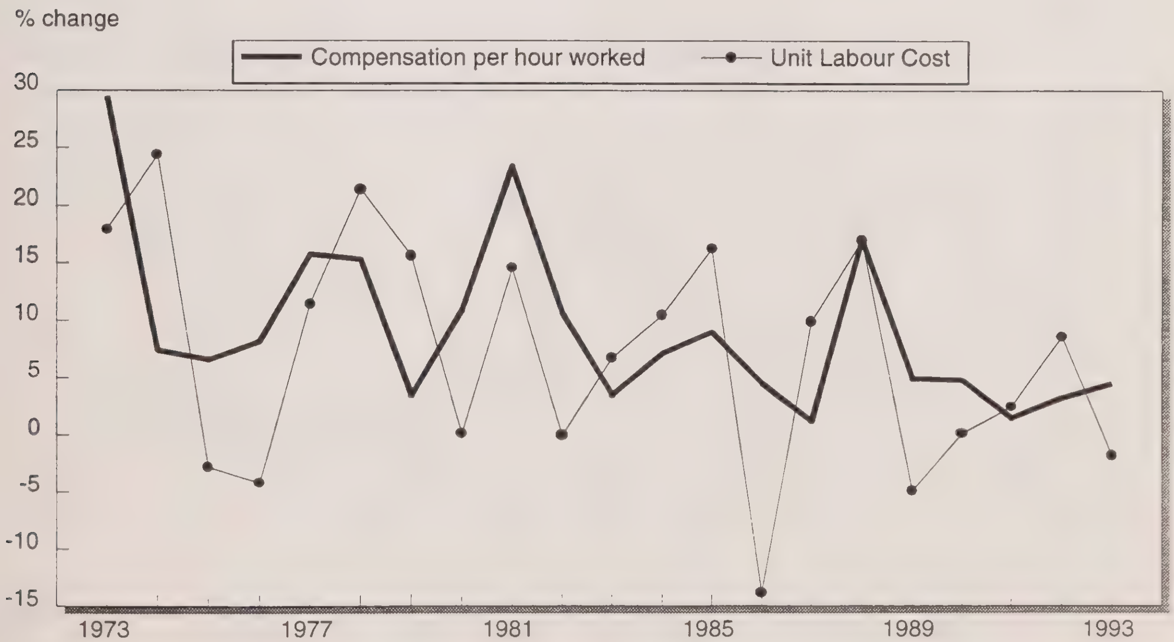


Table 6

Indices of labour productivity and unit labour cost, manufacturing industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	78.2	97.8	102.6	100.3	29.7	77.9	30.4	29.6	38.0
1974	80.5	99.8	101.9	101.7	34.6	79.2	34.7	34.1	43.0
1975	75.1	97.5	100.8	98.3	38.3	76.5	39.3	38.9	50.9
1976	80.6	97.9	100.6	98.6	43.9	81.8	44.8	44.6	54.5
1977	83.6	95.9	100.9	96.8	47.7	86.3	49.8	49.3	57.1
1978	87.4	98.9	101.2	100.1	53.2	87.3	53.7	53.1	60.8
1979	90.6	102.5	100.4	102.9	60.2	88.1	58.7	58.5	66.4
1980	86.6	102.2	100.0	102.2	66.2	84.7	64.8	64.8	76.4
1981	89.8	102.2	98.9	101.0	75.3	88.9	73.7	74.5	83.9
1982	78.2	94.3	97.8	92.2	75.9	84.8	80.6	82.4	97.1
1983	83.2	92.4	99.0	91.5	79.9	91.0	86.6	87.4	96.1
1984	94.0	95.2	100.1	95.2	87.2	98.7	91.6	91.5	92.8
1985	99.3	97.6	100.1	97.7	94.1	101.6	96.4	96.3	94.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.8	103.0	100.8	103.9	107.0	100.9	103.8	103.0	102.0
1988	110.2	107.5	101.0	108.7	116.8	101.4	108.6	107.5	106.1
1989	111.1	108.8	100.3	109.2	121.8	101.8	111.9	111.6	109.6
1990	107.0	103.2	100.2	103.4	121.8	103.5	118.1	117.8	113.8
1991	99.6	95.9	99.7	95.6	119.5	104.2	124.6	125.0	119.9
1992	100.3	91.6	100.9	92.4	120.4	108.6	131.4	130.3	120.0
1993	105.4	92.2	102.9	94.8	124.3	111.1	134.8	131.0	118.0

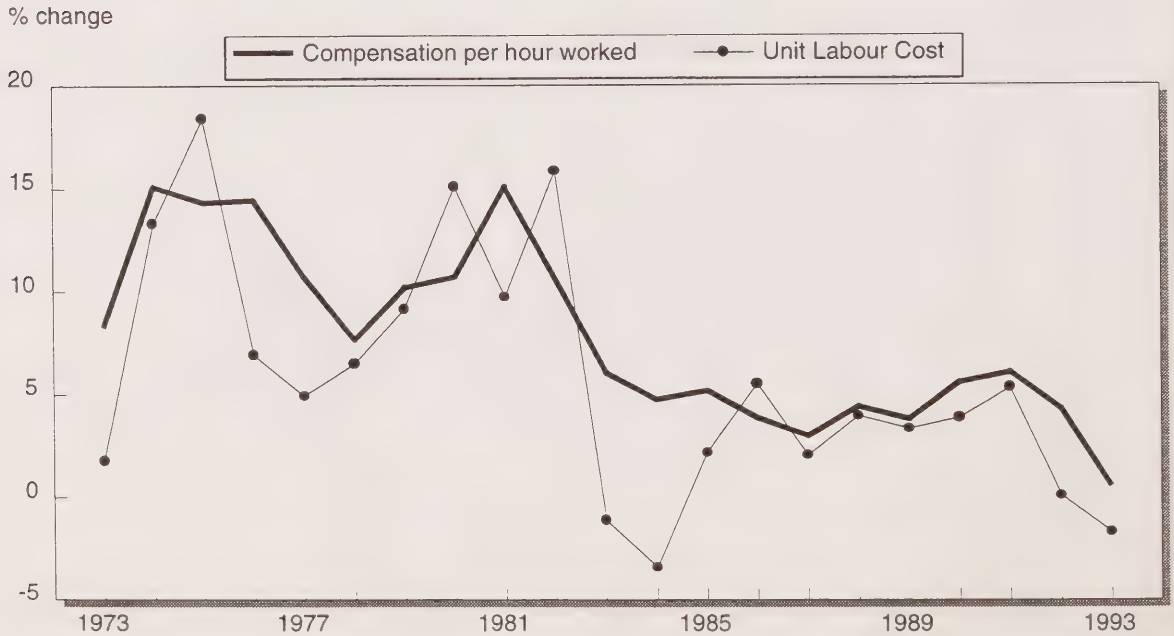


Table 7

Indices of labour productivity and unit labour cost, construction industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	63.5	91.4	102.8	95.6	32.7	66.5	35.8	34.2	51.5
1974	65.5	96.4	103.2	100.8	39.6	65.0	41.1	39.3	60.5
1975	72.7	94.8	102.4	98.5	47.1	73.8	49.7	47.8	64.8
1976	81.9	99.9	101.6	102.8	54.6	79.6	54.7	53.1	66.7
1977	86.1	101.4	99.9	101.7	60.5	84.6	59.7	59.5	70.3
1978	81.8	98.5	101.6	100.0	59.7	81.8	60.6	59.7	73.0
1979	82.6	103.2	102.2	105.4	63.7	78.4	61.7	60.4	77.0
1980	86.8	101.5	102.7	104.3	72.7	83.3	71.7	69.8	83.8
1981	96.7	103.2	102.1	105.0	88.4	92.1	85.6	84.2	91.4
1982	96.8	96.7	97.9	93.0	84.9	104.0	87.9	91.3	87.8
1983	95.1	93.3	99.1	91.0	83.4	104.4	89.4	91.7	87.8
1984	89.1	91.4	100.4	90.6	84.6	98.3	92.6	93.4	95.0
1985	96.0	98.4	101.5	99.3	92.0	96.7	93.5	92.7	95.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.7	105.8	103.6	109.5	117.6	96.5	111.1	107.4	111.2
1988	109.7	113.6	104.3	118.9	134.8	92.3	118.7	113.4	122.9
1989	115.7	119.7	104.0	124.4	151.3	93.0	126.4	121.6	130.7
1990	115.4	123.0	101.5	124.3	158.6	92.8	128.9	127.6	137.5
1991	106.3	113.9	100.4	113.0	149.0	94.1	130.8	131.8	140.1
1992	97.3	111.7	98.7	108.9	143.0	89.4	128.1	131.3	146.9
1993	92.7	109.2	100.6	108.5	140.7	85.5	128.9	129.7	151.8

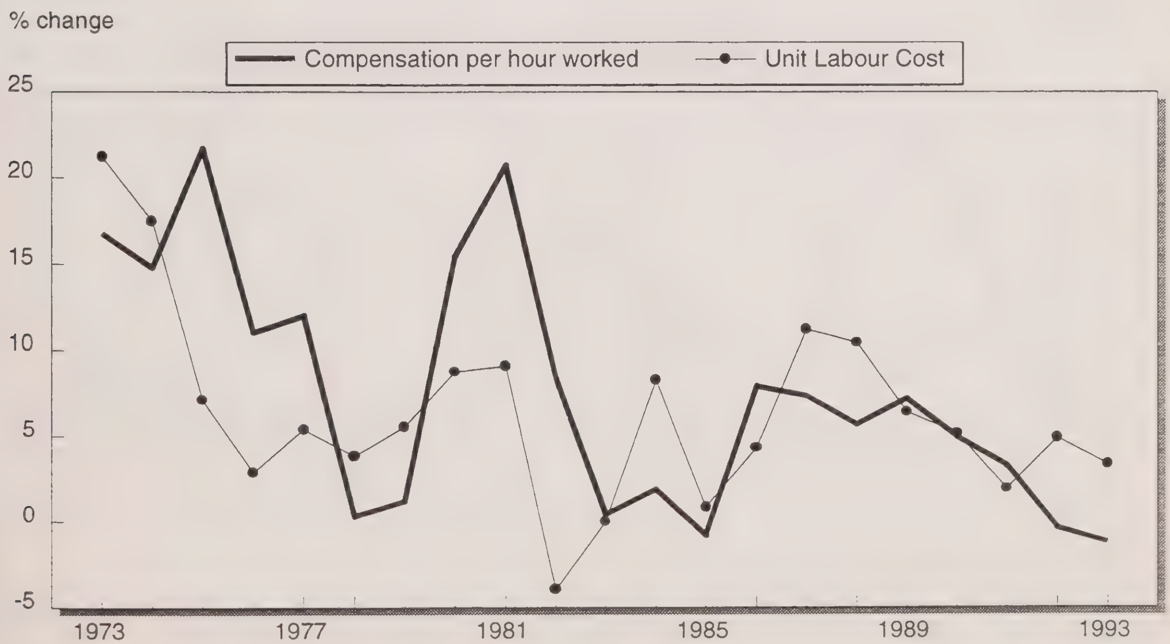


Table 8

Indices of labour productivity and unit labour cost, transportation & storage industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	70.6	84.5	100.5	85.8	27.2	82.3	32.2	31.7	38.5
1974	73.7	89.6	100.2	90.7	32.6	81.3	36.3	35.9	44.2
1975	72.6	88.6	99.7	89.2	37.8	81.3	42.6	42.3	52.0
1976	72.1	87.8	98.3	87.4	42.2	82.5	48.1	48.3	58.6
1977	75.2	93.2	97.4	91.8	48.0	81.9	51.5	52.3	63.8
1978	79.0	95.2	100.2	95.9	53.1	82.4	55.8	55.4	67.2
1979	88.4	98.2	99.4	98.1	59.4	90.1	60.5	60.5	67.2
1980	85.3	102.7	99.8	103.2	67.0	82.7	65.2	64.9	78.5
1981	84.3	104.2	99.2	103.3	75.9	81.6	72.9	73.5	90.0
1982	79.6	98.7	97.8	96.6	79.9	82.4	80.9	82.7	100.4
1983	85.5	94.1	96.7	90.6	82.0	94.3	87.1	90.4	95.9
1984	95.6	96.4	98.9	95.4	89.4	100.2	92.7	93.7	93.5
1985	97.6	97.0	98.2	95.8	95.4	101.8	98.4	99.6	97.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.9	102.5	100.0	103.2	105.2	103.6	102.7	102.0	98.4
1988	112.4	102.3	101.1	104.0	112.0	108.0	109.4	107.6	99.6
1989	110.6	103.6	100.3	105.1	118.4	105.3	114.3	112.6	107.0
1990	108.2	103.5	99.9	103.8	121.2	104.3	117.1	116.8	112.0
1991	103.2	100.4	98.4	99.0	124.7	104.3	124.3	126.0	120.9
1992	104.1	98.9	96.8	96.6	126.7	107.7	128.1	131.1	121.7
1993	107.2	96.7	97.9	95.2	128.9	112.5	133.2	135.3	120.2

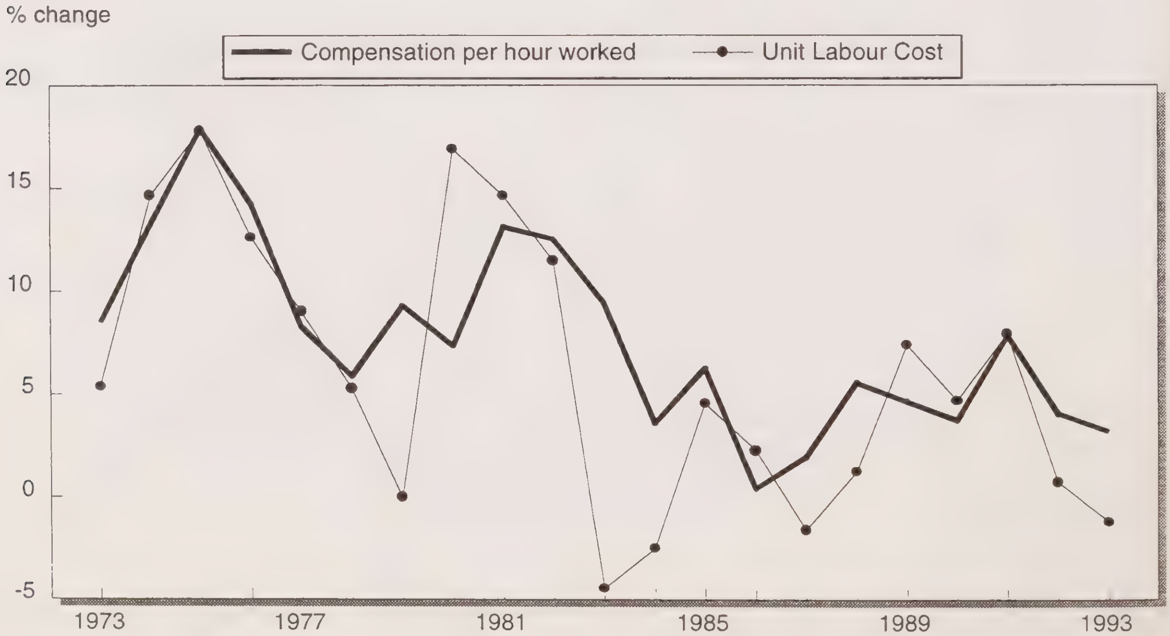


Table 9

Indices of labour productivity and unit labour cost, communication industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	39.8	80.5	102.3	82.2	22.4	48.4	27.9	27.3	56.4
1974	44.9	86.4	102.1	88.0	26.7	51.0	30.9	30.3	59.5
1975	50.6	86.6	100.7	86.9	31.5	58.2	36.3	36.2	62.2
1976	55.7	93.2	100.0	93.0	38.1	59.9	40.9	41.0	68.5
1977	59.1	96.3	99.5	95.7	44.6	61.8	46.3	46.6	75.4
1978	64.8	95.0	100.3	95.2	49.0	68.1	51.6	51.5	75.6
1979	71.2	96.7	99.3	95.9	55.4	74.3	57.3	57.8	77.9
1980	77.9	99.3	99.4	98.3	62.4	79.2	62.8	63.4	80.0
1981	84.0	102.0	98.9	100.4	73.3	83.7	71.9	73.0	87.3
1982	83.9	103.8	98.6	102.2	81.3	82.1	78.4	79.6	96.9
1983	86.1	102.3	96.4	98.2	86.2	87.7	84.2	87.8	100.2
1984	90.2	101.4	98.6	99.6	93.5	90.6	92.2	93.9	103.6
1985	95.4	101.3	99.8	101.2	98.4	94.3	97.1	97.3	103.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.7	102.7	99.7	102.4	106.2	104.3	103.4	103.8	99.5
1988	114.9	103.7	100.6	104.2	110.1	110.2	106.1	105.6	95.8
1989	127.1	104.7	100.1	104.4	119.0	121.7	113.6	114.0	93.6
1990	136.2	103.9	99.9	102.7	125.6	132.7	120.9	122.4	92.2
1991	140.3	102.7	98.8	100.6	133.5	139.5	130.0	132.7	95.1
1992	143.5	103.6	97.6	100.4	140.5	142.9	135.6	140.0	97.9
1993	147.8	103.3	97.2	99.6	138.2	148.5	133.7	138.7	93.5

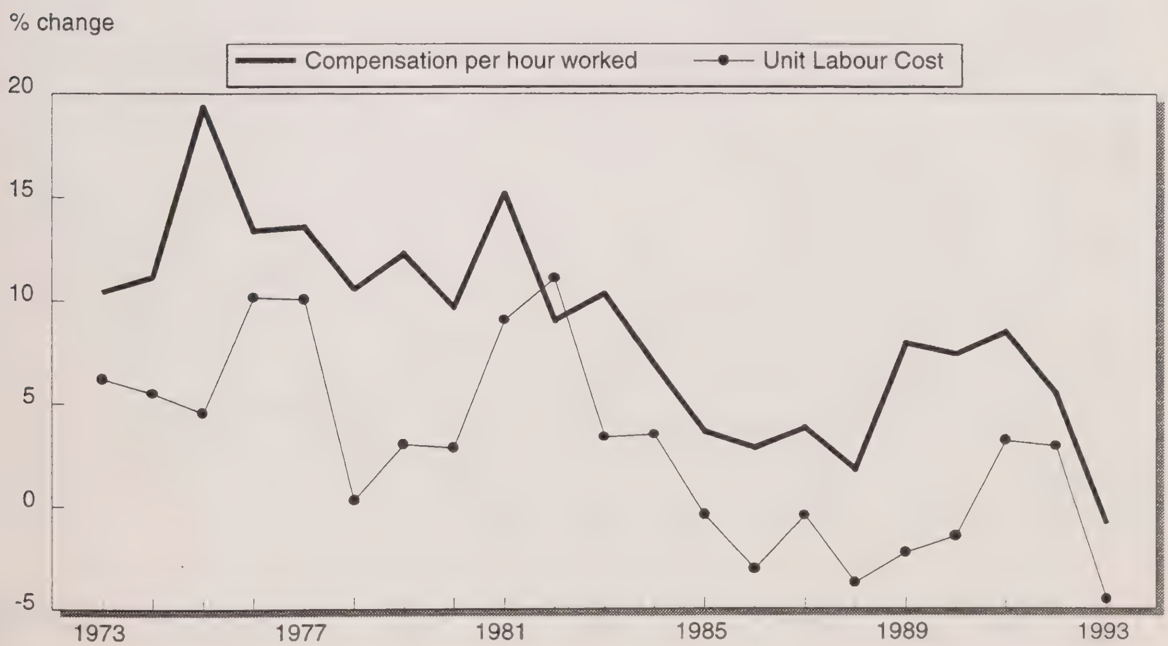


Table 10

Indices of labour productivity and unit labour cost, wholesale trade industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	56.4	68.6	104.1	72.0	24.1	78.4	35.1	33.4	42.7
1974	58.5	72.1	101.4	73.7	29.1	79.4	40.3	39.4	49.7
1975	60.2	74.0	99.9	74.7	35.4	80.6	47.9	47.4	58.9
1976	63.8	74.9	100.4	75.8	40.2	84.2	53.6	53.0	63.0
1977	62.2	77.6	98.8	77.2	43.0	80.6	55.4	55.7	69.1
1978	63.5	81.4	100.2	82.1	47.5	77.4	58.3	57.8	74.8
1979	67.3	82.7	99.1	82.4	54.0	81.6	65.2	65.5	80.2
1980	72.1	81.3	99.9	81.3	61.1	88.7	75.2	75.2	84.8
1981	77.0	87.1	99.7	86.7	69.8	88.8	80.2	80.5	90.7
1982	70.6	83.2	98.4	82.1	71.4	86.0	85.8	87.0	101.1
1983	77.0	89.2	97.4	87.1	76.1	88.4	85.4	87.5	98.9
1984	83.0	94.8	97.7	92.7	84.8	89.6	89.5	91.5	102.2
1985	93.4	100.2	98.0	98.4	92.9	94.9	92.6	94.4	99.5
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	107.8	106.0	100.0	105.9	113.7	101.8	107.3	107.4	105.4
1988	115.7	109.7	100.2	109.7	125.5	105.5	114.3	114.4	108.4
1989	120.6	113.1	98.9	111.7	137.4	107.9	121.5	123.0	113.9
1990	122.0	118.1	100.0	118.4	149.2	103.0	126.2	126.0	122.3
1991	118.5	113.0	100.0	112.8	148.5	105.0	131.4	131.6	125.3
1992	127.1	112.0	99.6	111.6	153.8	113.9	137.3	137.9	121.0
1993	133.9	113.4	100.1	113.2	156.2	118.4	137.7	138.0	116.6

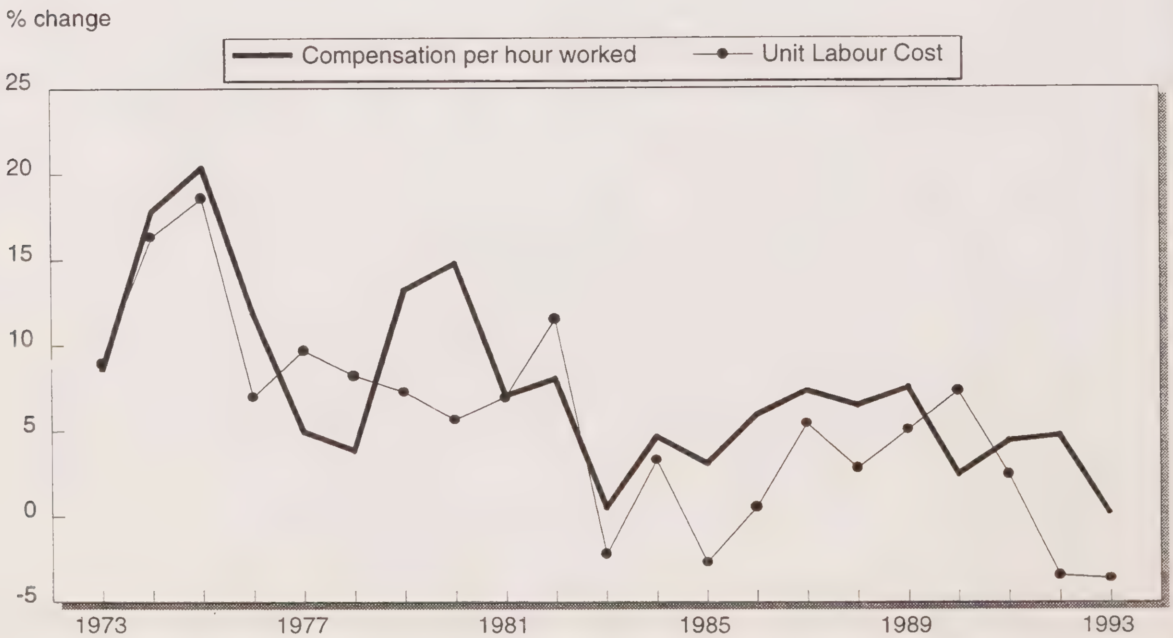


Table 11

Indices of labour productivity and unit labour cost, retail trade industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	72.9	72.5	105.2	78.3	26.8	93.1	36.9	34.2	36.7
1974	74.7	76.9	105.1	82.7	31.8	90.4	41.3	38.4	42.5
1975	78.4	79.3	104.1	84.7	37.6	92.7	47.4	44.4	47.9
1976	83.1	80.2	102.9	84.2	42.8	98.7	53.3	50.8	51.5
1977	83.5	81.2	102.0	84.5	47.4	98.9	58.4	56.1	56.7
1978	85.1	85.1	101.6	87.9	49.9	96.9	58.6	56.8	58.6
1979	85.8	88.3	101.4	91.0	56.4	94.3	63.9	62.0	65.8
1980	84.9	91.3	101.4	93.5	62.6	90.8	68.6	67.0	73.7
1981	85.5	95.2	101.3	96.8	70.3	88.2	73.8	72.6	82.3
1982	82.5	92.7	99.0	92.1	76.0	89.5	82.0	82.5	92.2
1983	86.8	89.1	97.9	87.1	78.2	99.6	87.8	89.8	90.1
1984	91.9	93.8	98.9	93.0	86.1	98.8	91.7	92.5	93.6
1985	96.8	97.3	99.2	96.7	93.3	100.1	96.0	96.5	96.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.9	100.9	99.6	100.4	107.1	105.4	106.2	106.7	101.2
1988	109.1	103.6	99.7	102.8	117.6	106.2	113.5	114.4	107.7
1989	111.8	105.4	98.7	104.1	127.6	107.5	121.1	122.6	114.1
1990	109.3	105.6	99.5	105.1	132.8	104.0	125.8	126.4	121.5
1991	104.3	104.5	97.7	101.9	134.6	102.3	128.8	132.2	129.1
1992	106.3	103.3	98.6	101.7	136.2	104.5	131.9	133.9	128.1
1993	110.2	105.3	98.7	103.3	141.3	106.7	134.2	136.8	128.2

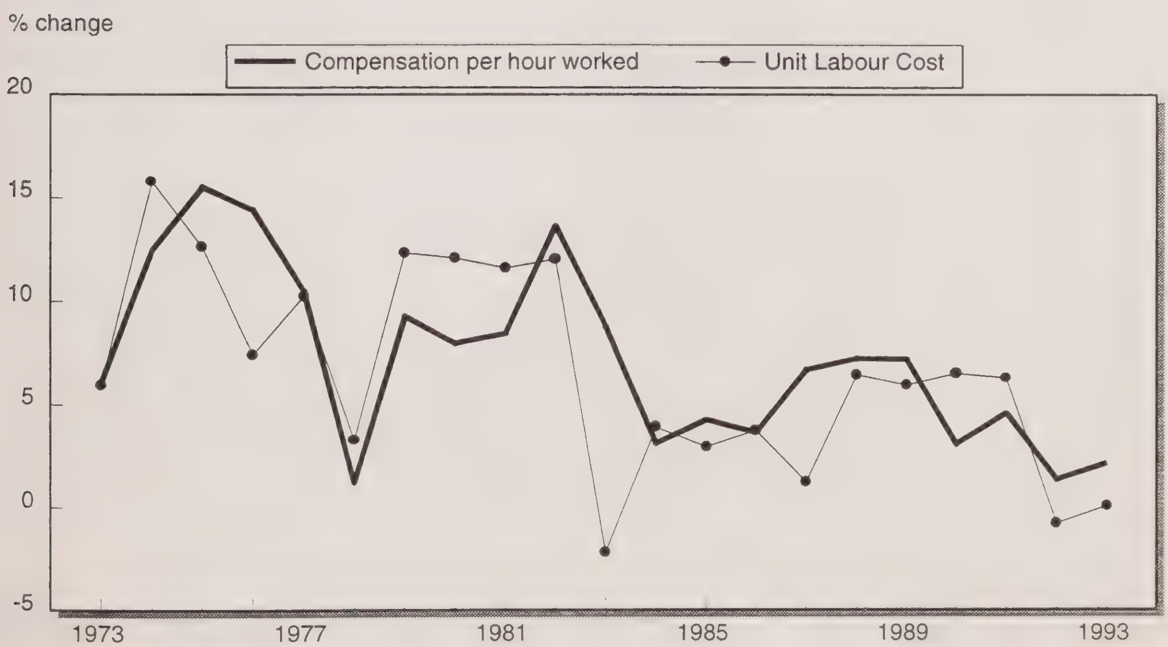


Table 12

Indices of labour productivity and unit labour cost, community, business, personal services industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	52.7	49.0	105.8	53.3	20.4	98.9	41.7	38.3	38.8
1974	57.2	53.0	105.0	57.1	24.4	100.2	46.0	42.7	42.6
1975	59.9	56.1	105.0	60.5	27.6	99.0	49.1	45.5	46.0
1976	64.6	58.6	104.2	62.8	33.0	102.8	56.3	52.6	51.1
1977	66.3	62.4	101.6	65.0	36.3	102.0	58.1	55.8	54.7
1978	70.9	65.9	103.2	69.7	40.4	101.7	61.3	57.9	56.9
1979	73.6	70.7	102.4	73.9	45.6	99.5	64.5	61.7	62.0
1980	81.0	75.4	102.3	78.0	54.2	103.8	71.8	69.5	66.9
1981	87.6	80.2	101.8	82.5	62.8	106.2	78.2	76.1	71.7
1982	86.3	82.9	99.9	83.5	70.1	103.4	84.5	83.9	81.1
1983	85.1	86.6	98.6	86.4	74.3	98.5	85.7	85.9	87.2
1984	90.1	88.6	99.3	88.7	82.1	101.6	92.7	92.6	91.1
1985	93.6	97.0	100.0	97.4	91.7	96.1	94.5	94.2	98.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.7	105.2	101.1	106.3	113.0	99.4	107.4	106.3	106.9
1988	113.7	111.1	102.1	113.1	127.4	100.5	114.7	112.6	112.1
1989	119.2	115.7	100.9	116.5	142.6	102.3	123.3	122.4	119.6
1990	118.1	119.2	100.9	120.3	153.2	98.2	128.5	127.4	129.8
1991	116.2	117.1	99.0	116.4	159.2	99.8	136.0	136.8	137.1
1992	115.4	119.2	97.8	116.9	165.5	98.7	138.8	141.6	143.4
1993	118.0	125.8	99.0	124.5	174.3	94.8	138.6	140.0	147.7

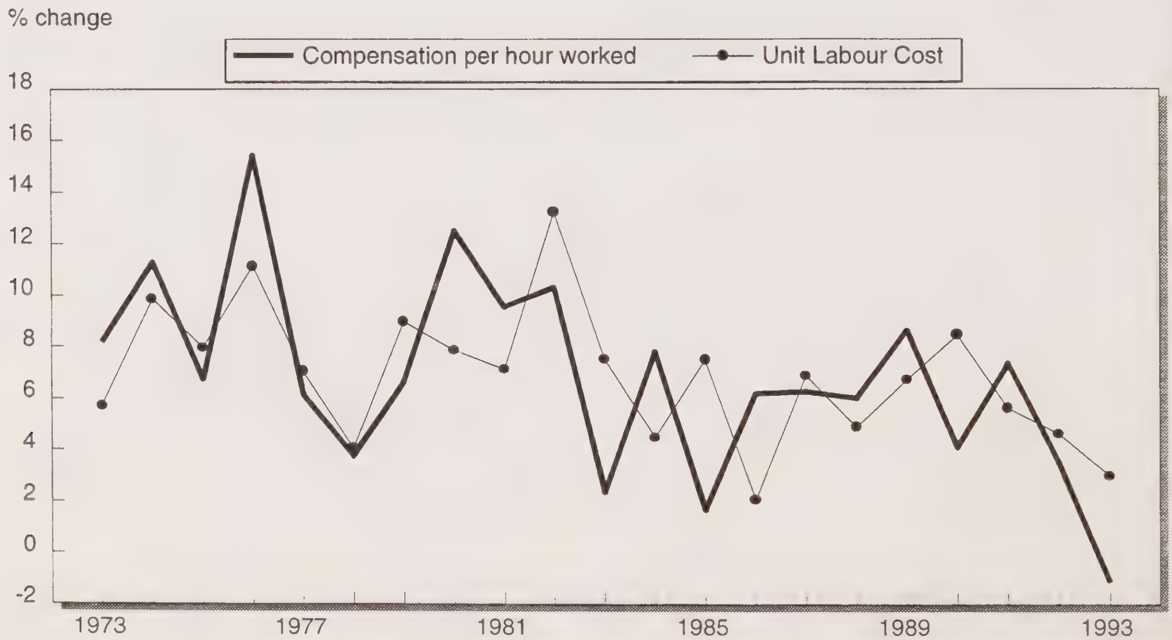


Table 13

Indices of labour productivity and unit labour cost, food industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	83.0	98.4	103.4	101.8	29.5	81.5	30.0	29.0	35.6
1974	82.2	96.9	103.4	100.2	33.8	82.0	34.8	33.7	41.1
1975	76.3	96.6	103.8	100.2	39.4	76.2	40.8	39.4	51.6
1976	84.6	96.4	103.6	99.9	44.9	84.7	46.6	45.0	53.1
1977	89.3	98.0	102.7	100.6	49.6	88.8	50.7	49.3	55.6
1978	90.6	100.1	102.5	102.6	54.4	88.3	54.3	53.0	60.0
1979	93.7	101.1	102.3	103.4	60.5	90.7	59.8	58.5	64.5
1980	91.3	102.4	101.1	103.5	67.2	88.1	65.6	64.9	73.6
1981	92.0	101.1	99.9	101.1	75.9	91.0	75.0	75.1	82.5
1982	91.9	98.2	99.3	97.5	80.7	94.3	82.2	82.8	87.8
1983	90.3	95.9	101.6	97.4	84.9	92.7	88.5	87.2	94.0
1984	94.4	96.0	101.9	97.9	88.4	96.4	92.1	90.4	93.7
1985	100.6	98.6	100.4	99.0	93.8	101.6	95.2	94.7	93.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	100.7	101.1	101.0	102.2	106.1	98.6	104.9	103.9	105.3
1988	100.3	102.7	101.9	104.6	113.4	95.8	110.4	108.4	113.1
1989	97.1	103.6	100.9	104.5	116.4	92.9	112.3	111.3	119.9
1990	98.9	101.6	102.2	103.8	119.9	95.2	118.1	115.5	121.3
1991	98.0	98.5	101.2	99.6	121.5	98.4	123.4	122.0	124.0

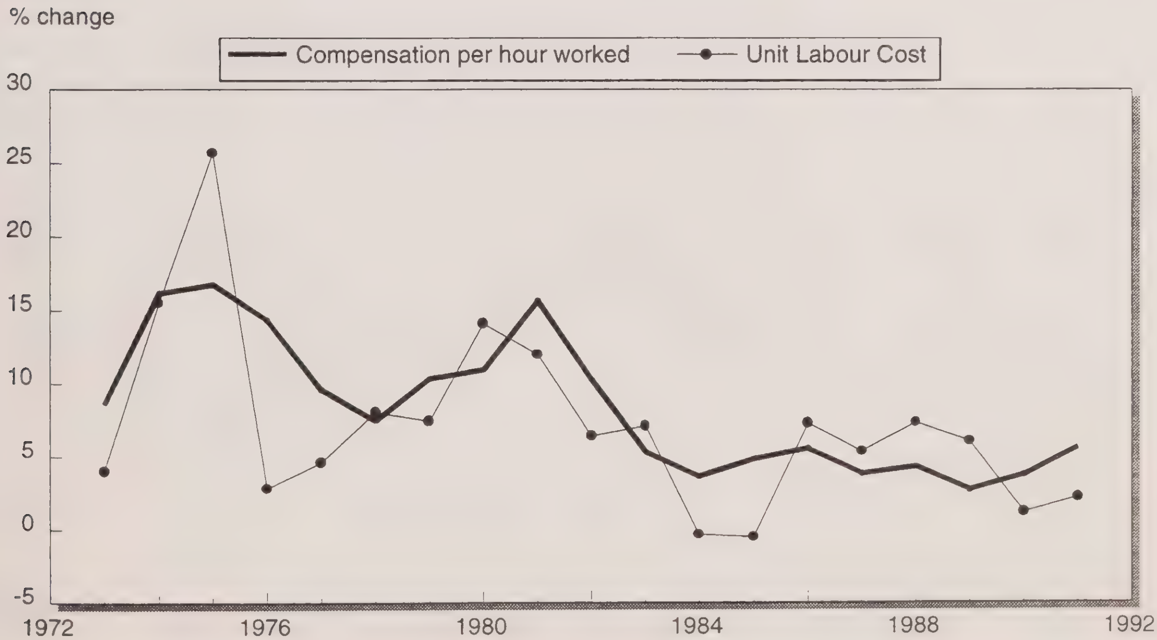


Table 14

Indices of labour productivity and unit labour cost, beverage industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	119.6	99.1	103.7	102.8	28.1	116.4	28.4	27.4	23.5
1974	121.0	102.7	103.7	106.5	33.1	113.7	32.2	31.0	27.3
1975	116.3	103.0	104.1	107.2	38.4	108.5	37.3	35.9	33.1
1976	112.7	103.3	103.9	107.3	44.2	105.0	42.8	41.2	39.3
1977	118.3	104.4	103.0	107.5	48.9	110.1	46.9	45.5	41.4
1978	115.7	103.2	102.7	106.0	52.0	109.2	50.4	49.1	45.0
1979	118.3	105.0	102.6	107.6	58.4	109.9	55.6	54.2	49.3
1980	114.0	102.0	101.4	103.4	64.0	110.2	62.8	61.9	56.2
1981	113.4	103.1	100.2	103.3	72.0	109.8	69.8	69.7	63.5
1982	103.3	100.6	99.5	100.1	78.5	103.2	78.0	78.4	76.0
1983	99.3	98.7	100.2	98.9	84.2	100.4	85.3	85.1	84.8
1984	103.8	99.9	97.6	97.5	89.7	106.5	89.8	92.0	86.4
1985	105.4	100.6	100.4	100.9	94.8	104.5	94.2	93.9	89.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	101.7	98.8	101.3	100.1	103.7	101.5	104.9	103.6	102.0
1988	105.1	99.2	102.9	102.1	106.8	102.9	107.6	104.6	101.6
1989	106.3	87.4	99.0	86.5	98.4	122.9	112.6	113.8	92.6
1990	101.8	75.2	100.1	75.3	90.9	135.3	120.9	120.8	89.3
1991	91.9	72.9	99.5	72.6	96.7	126.7	132.5	133.2	105.2

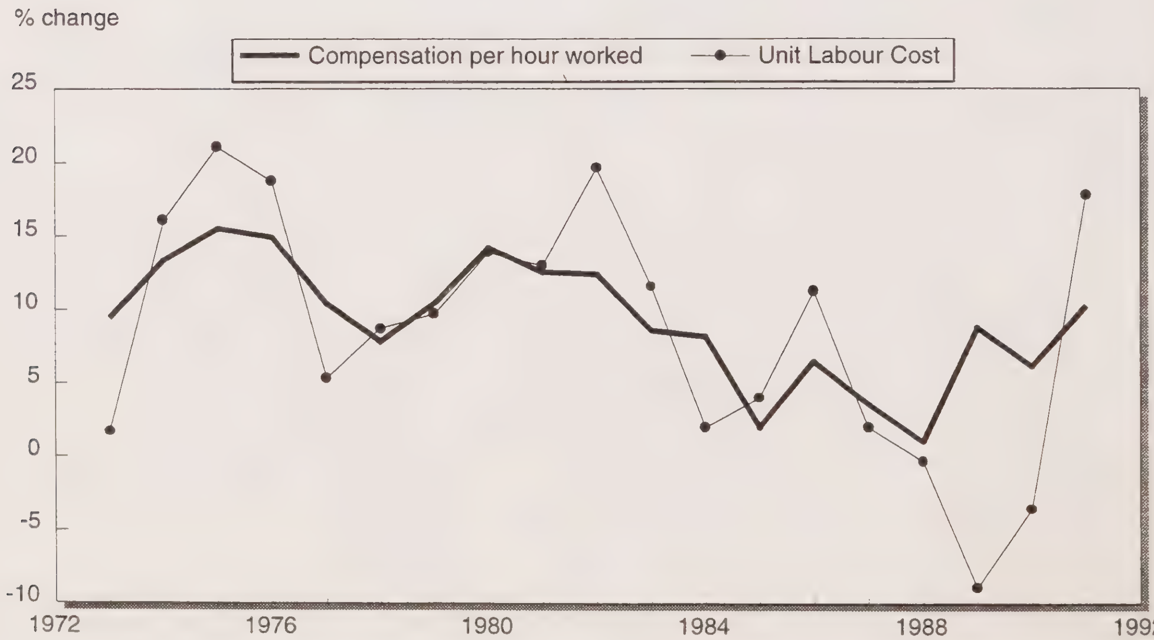


Table 15

Indices of labour productivity and unit labour cost, tobacco products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	142.1	133.7	109.7	146.7	32.6	96.9	24.4	22.2	22.9
1974	152.9	136.5	108.1	147.6	36.4	103.6	26.7	24.7	23.8
1975	154.4	138.2	109.2	151.0	43.9	102.2	31.8	29.1	28.5
1976	146.8	129.7	109.5	142.1	47.2	103.3	36.4	33.2	32.1
1977	168.4	127.4	106.8	136.0	52.2	123.9	41.0	38.4	31.0
1978	142.6	124.8	107.2	133.7	53.8	106.7	43.2	40.3	37.8
1979	147.5	123.7	107.5	133.0	58.3	110.9	47.2	43.9	39.6
1980	149.6	120.8	105.3	127.2	63.9	117.6	52.9	50.3	42.7
1981	153.4	124.2	106.7	132.5	77.4	115.7	62.3	58.4	50.4
1982	149.6	123.7	104.1	128.7	84.0	116.2	67.9	65.3	56.1
1983	135.2	115.0	104.4	120.0	89.2	112.6	77.6	74.3	66.0
1984	128.3	109.1	103.8	113.3	91.9	113.2	84.2	81.1	71.6
1985	105.9	101.5	106.0	107.6	96.2	98.4	94.7	89.4	90.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.5	85.1	102.9	87.5	94.8	121.6	111.4	108.3	89.1
1988	108.6	78.7	103.3	81.3	89.6	133.5	113.9	110.2	82.5
1989	99.9	73.7	102.0	75.2	90.8	132.8	123.2	120.7	90.9
1990	96.6	70.5	103.4	73.0	92.9	132.4	131.7	127.3	96.2
1991	94.3	68.8	103.6	71.3	97.9	132.2	142.3	137.3	103.8

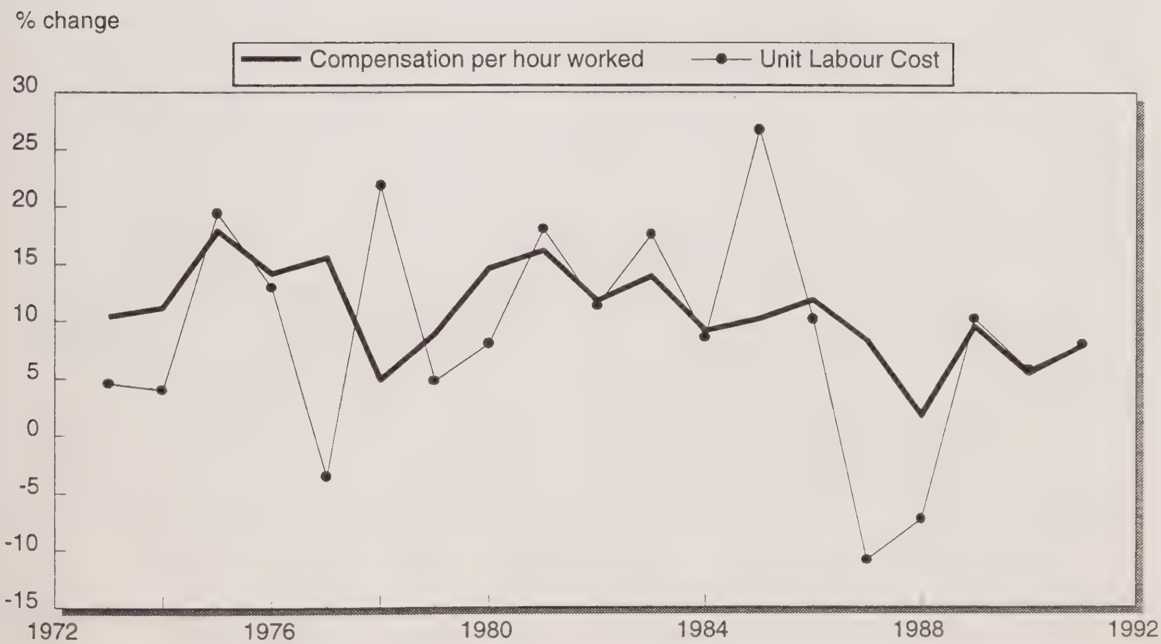


Table 16

Indices of labour productivity and unit labour cost, rubber products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	74.5	97.0	103.1	100.0	29.2	74.5	30.1	29.2	39.2
1974	66.9	95.2	101.0	96.1	31.2	69.6	32.8	32.4	46.6
1975	64.0	96.4	100.5	97.0	35.9	66.0	37.3	37.1	56.2
1976	79.3	100.8	101.4	102.1	41.9	77.6	41.6	41.0	52.8
1977	90.9	101.1	100.8	102.0	45.9	89.1	45.4	45.0	50.5
1978	94.6	102.9	101.1	104.0	49.9	91.0	48.6	48.0	52.8
1979	107.6	105.7	103.6	109.6	60.1	98.2	56.9	54.9	55.9
1980	92.7	102.2	100.8	103.1	63.4	90.0	62.0	61.5	68.3
1981	88.0	103.3	101.7	105.1	73.5	83.7	71.2	70.0	83.6
1982	76.7	97.3	101.2	98.5	76.4	77.9	78.5	77.6	99.6
1983	89.6	97.6	101.4	99.0	81.4	90.5	83.4	82.3	90.9
1984	112.9	99.3	101.2	100.5	90.6	112.3	91.2	90.1	80.3
1985	114.5	98.4	101.5	99.9	93.4	114.6	94.8	93.4	81.5
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.7	94.1	100.5	94.6	97.0	110.8	103.1	102.6	92.6
1988	110.0	101.6	101.8	103.4	109.1	106.3	107.4	105.6	99.3
1989	106.4	99.4	101.4	100.7	109.3	105.6	110.0	108.5	102.7
1990	103.8	96.4	100.2	96.6	112.8	107.5	117.0	116.8	108.6
1991	93.4	88.9	100.3	89.2	109.8	104.7	123.4	123.0	117.5

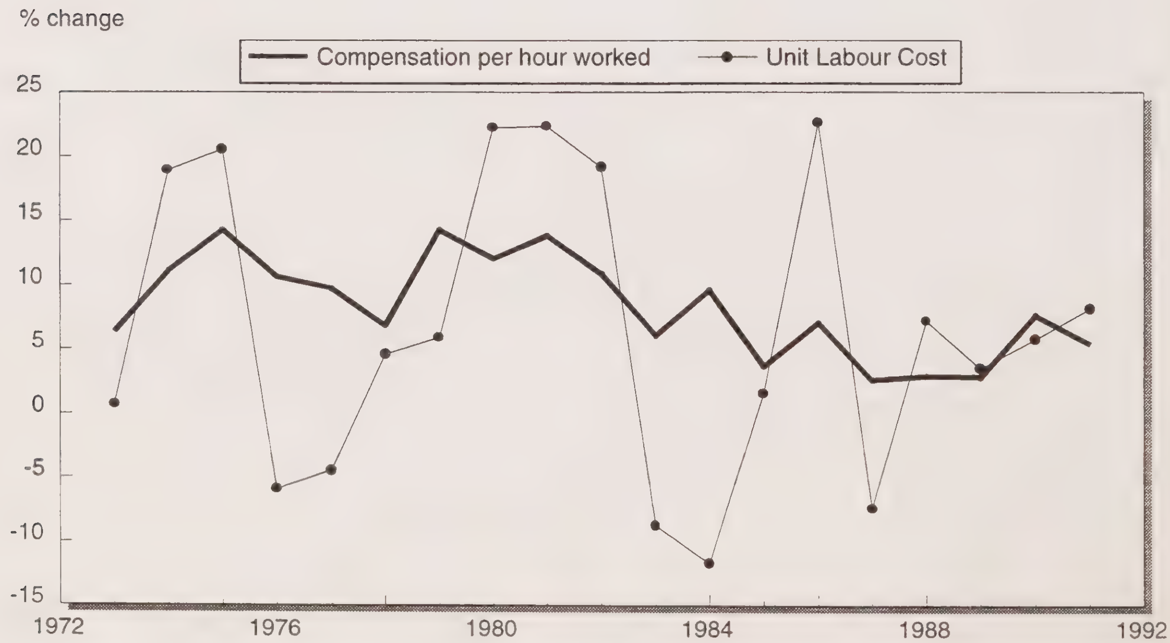


Table 17

Indices of labour productivity and unit labour cost, plastic products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	54.4	63.9	101.9	65.1	20.3	83.5	31.7	31.2	37.3
1974	52.7	66.7	99.8	66.6	24.3	79.1	36.4	36.5	46.1
1975	47.9	65.5	99.4	65.1	26.7	73.6	40.8	41.0	55.7
1976	53.5	68.7	100.2	68.8	32.1	77.8	46.7	46.6	59.9
1977	56.2	69.6	99.6	69.3	35.7	81.0	51.3	51.5	63.6
1978	63.7	76.1	99.9	76.0	42.0	83.8	55.2	55.2	65.9
1979	73.7	80.0	102.4	82.0	48.1	90.0	60.2	58.7	65.3
1980	73.5	82.4	99.6	82.1	54.6	89.5	66.2	66.5	74.3
1981	75.5	81.6	100.5	82.0	61.6	92.0	75.5	75.1	81.6
1982	68.8	76.4	100.0	76.4	62.6	90.1	82.0	82.0	91.0
1983	78.7	76.3	101.2	77.2	67.4	101.9	88.3	87.3	85.6
1984	90.1	85.4	100.2	85.6	77.9	105.3	91.2	91.1	86.5
1985	99.6	92.3	101.2	93.4	89.1	106.7	96.5	95.4	89.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	112.3	108.0	100.8	108.8	111.8	103.2	103.5	102.7	99.5
1988	115.1	122.2	101.1	123.5	133.3	93.2	109.1	107.9	115.8
1989	118.7	127.6	102.4	130.6	142.7	90.9	111.8	109.2	120.2
1990	113.4	125.5	101.0	126.7	149.5	89.6	119.2	118.0	131.8
1991	107.5	122.7	101.3	124.3	149.2	86.5	121.6	120.0	138.7

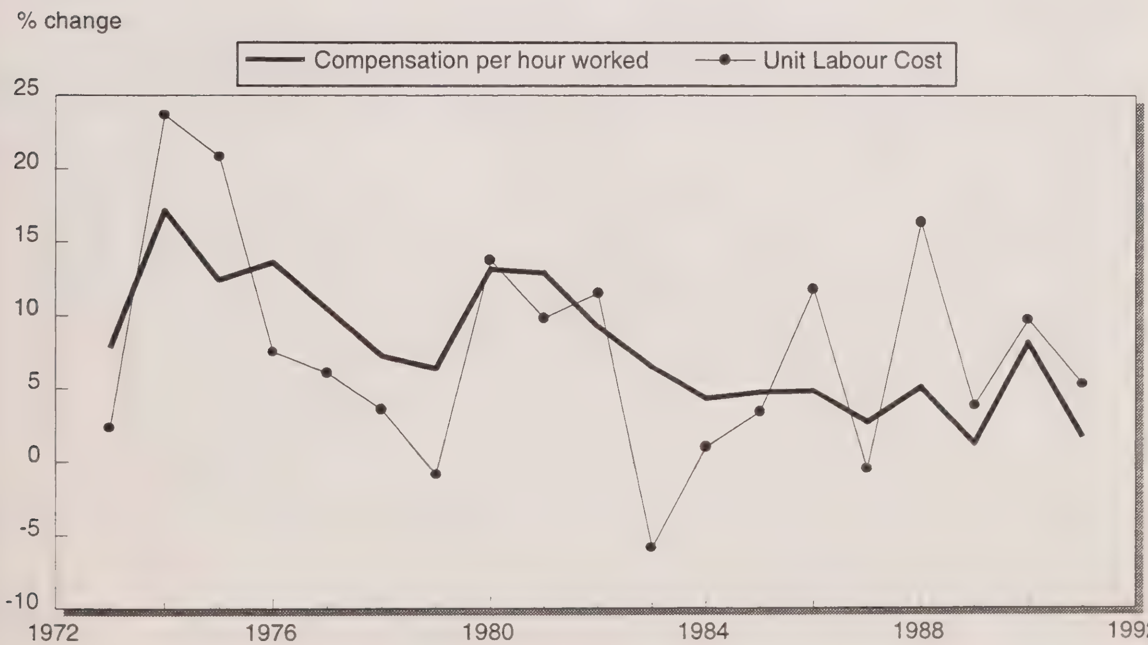


Table 18

Indices of labour productivity and unit labour cost, leather & allied products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	83.8	124.0	104.2	129.2	41.0	64.8	33.1	31.7	48.9
1974	86.8	121.0	105.9	128.2	46.6	67.7	38.5	36.4	53.7
1975	87.2	121.7	102.9	125.2	52.6	69.7	43.2	42.0	60.3
1976	95.9	120.4	103.7	124.9	59.7	76.8	49.6	47.8	62.3
1977	88.9	107.7	104.0	112.0	58.6	79.3	54.4	52.3	65.9
1978	101.7	110.9	103.3	114.5	66.0	88.8	59.5	57.6	64.9
1979	103.1	115.8	104.0	120.4	75.6	85.6	65.3	62.8	73.4
1980	98.5	113.2	102.4	115.9	78.6	84.9	69.4	67.8	79.8
1981	103.5	117.3	102.3	120.1	91.5	86.2	78.0	76.2	88.4
1982	90.2	101.2	103.3	104.6	85.2	86.2	84.2	81.5	94.5
1983	95.2	101.9	100.6	102.5	89.3	92.9	87.7	87.2	93.8
1984	104.3	104.1	101.5	105.6	96.7	98.7	92.9	91.5	92.7
1985	100.1	98.6	101.4	99.9	97.0	100.2	98.5	97.1	97.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	92.6	92.9	98.1	91.1	96.1	101.6	103.4	105.5	103.8
1988	86.2	86.3	99.0	85.5	92.0	100.9	106.6	107.7	106.7
1989	83.5	79.1	103.5	81.8	86.3	102.0	109.2	105.5	103.4
1990	72.5	71.0	102.2	72.6	85.2	99.9	119.9	117.3	117.4
1991	57.1	59.2	101.2	60.0	72.1	95.2	121.7	120.2	126.3

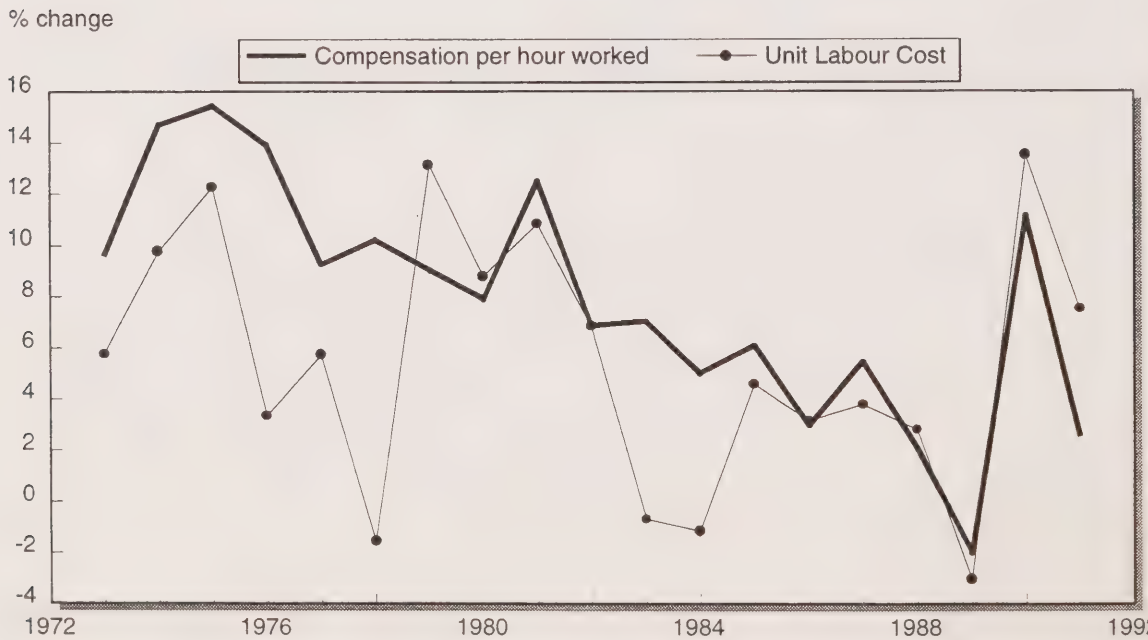


Table 19

Indices of labour productivity and unit labour cost, primary textile & textile products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	71.4	128.8	103.8	133.7	38.7	53.4	30.1	29.0	54.2
1974	72.1	128.7	102.9	132.4	43.9	54.4	34.1	33.1	60.9
1975	70.8	121.0	102.4	123.9	46.3	57.2	38.2	37.3	65.3
1976	72.0	113.3	101.8	115.3	50.4	62.4	44.5	43.7	70.0
1977	75.8	106.2	101.0	107.2	52.6	70.8	49.5	49.0	69.3
1978	83.4	108.1	101.1	109.3	58.3	76.3	53.9	53.3	69.9
1979	90.6	112.1	101.0	113.2	67.0	80.0	59.8	59.2	74.0
1980	88.1	111.3	99.8	111.1	73.5	79.3	66.0	66.1	83.4
1981	91.8	109.6	100.6	110.3	80.9	83.2	73.8	73.3	88.1
1982	71.2	96.4	101.3	97.7	75.7	72.9	78.5	77.5	106.3
1983	91.6	102.7	100.4	103.1	86.8	88.9	84.5	84.2	94.7
1984	91.1	101.5	99.6	101.1	90.3	90.1	89.0	89.3	99.2
1985	90.4	97.8	98.4	96.2	93.9	94.0	96.1	97.7	103.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	102.9	102.6	100.4	103.0	108.2	99.9	105.5	105.0	105.2
1988	101.2	104.5	100.9	105.4	113.7	96.0	108.8	107.8	112.3
1989	98.3	100.7	102.2	102.9	113.0	95.5	112.3	109.8	115.0
1990	89.2	94.6	100.4	95.0	111.0	93.8	117.3	116.8	124.5
1991	83.7	89.3	99.5	88.9	107.5	94.2	120.4	121.0	128.4

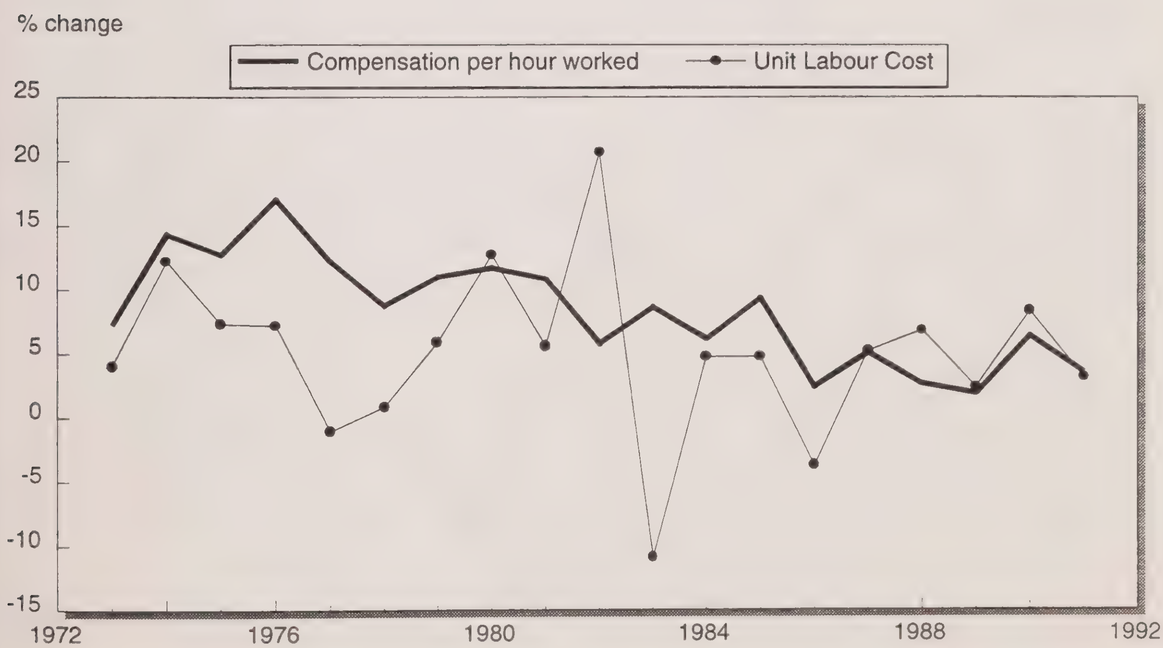


Table 20

Indices of labour productivity and unit labour cost, clothing industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	78.3	111.7	100.3	112.0	38.1	69.8	34.1	34.0	48.6
1974	78.9	109.0	100.9	109.9	42.9	71.8	39.4	39.0	54.3
1975	81.8	107.9	101.2	109.1	49.4	74.9	45.7	45.2	60.4
1976	87.2	109.4	100.8	110.2	56.7	79.1	51.9	51.5	65.1
1977	85.7	101.9	100.1	102.0	58.4	84.1	57.3	57.2	68.1
1978	92.9	102.6	100.0	102.5	64.1	90.6	62.5	62.5	68.9
1979	99.7	103.8	100.1	103.9	71.7	96.0	69.1	69.0	71.9
1980	94.1	99.9	98.4	98.3	75.7	95.7	75.8	77.1	80.5
1981	96.9	99.7	97.3	96.9	82.2	100.0	82.5	84.8	84.8
1982	86.1	94.0	95.7	89.9	80.3	95.7	85.5	89.3	93.3
1983	86.2	96.6	99.2	95.8	85.3	90.0	88.3	89.1	99.0
1984	92.8	97.3	100.0	97.3	90.1	95.4	92.6	92.6	97.1
1985	95.8	97.5	99.3	96.9	93.3	98.9	95.7	96.3	97.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	103.6	98.5	103.8	102.2	105.9	101.4	107.5	103.6	102.2
1988	101.4	101.6	101.6	103.2	112.8	98.3	111.0	109.2	111.2
1989	100.2	98.7	100.9	99.6	115.0	100.6	116.6	115.6	114.8
1990	95.3	91.1	101.9	92.9	111.6	102.6	122.5	120.2	117.1
1991	86.6	82.2	101.7	83.6	104.0	103.6	126.5	124.4	120.1

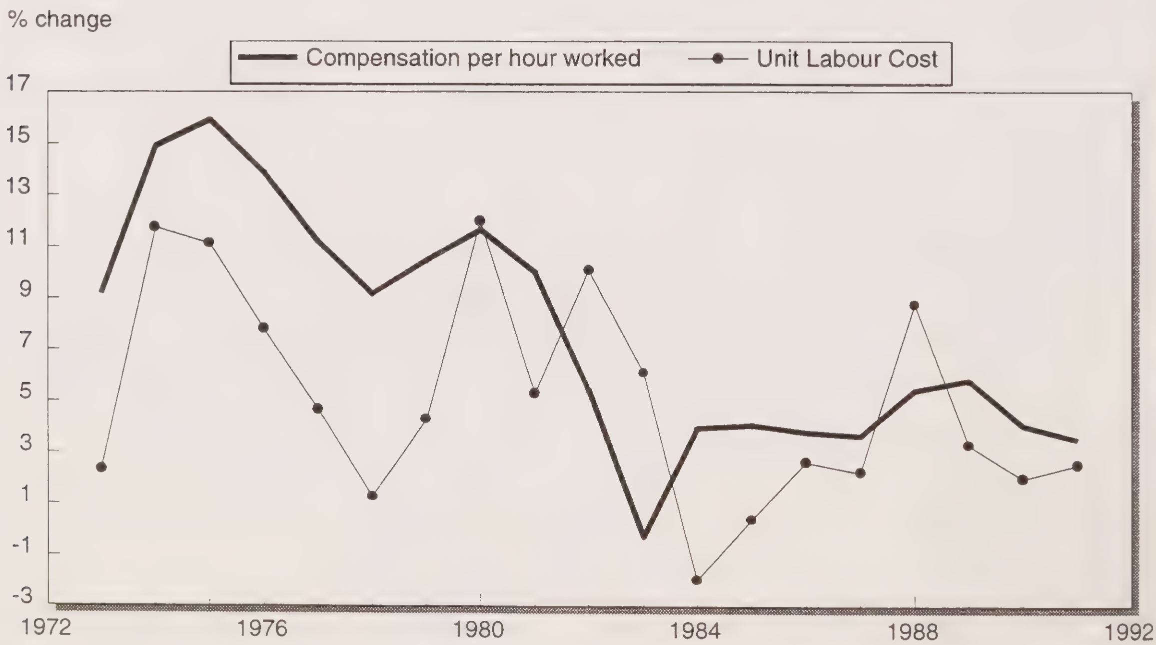


Table 21

Indices of labour productivity and unit labour cost, wood industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	61.3	101.5	103.5	105.0	31.3	58.4	30.8	29.8	51.1
1974	63.5	97.2	102.3	99.4	35.0	63.9	36.0	35.3	55.1
1975	56.4	89.3	101.9	90.9	36.6	62.1	41.0	40.3	64.9
1976	68.4	97.6	102.7	100.1	46.8	68.4	47.9	46.7	68.3
1977	75.9	100.0	101.9	101.8	54.1	74.6	54.1	53.1	71.2
1978	76.2	107.3	101.2	108.5	62.3	70.2	58.1	57.4	81.7
1979	76.4	110.2	101.3	111.5	70.9	68.5	64.4	63.6	92.8
1980	81.5	106.0	100.5	106.4	75.7	76.6	71.4	71.1	92.9
1981	78.3	101.7	95.4	97.0	79.4	80.7	78.1	81.9	101.4
1982	63.3	87.8	91.4	80.2	72.4	79.0	82.5	90.3	114.4
1983	78.3	92.0	96.7	89.0	83.6	88.0	90.9	94.0	106.9
1984	87.8	92.9	98.9	91.8	88.0	95.6	94.7	95.8	100.2
1985	99.7	97.0	99.8	96.8	95.3	103.0	98.3	98.5	95.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	115.5	109.4	100.6	110.0	116.3	105.0	106.4	105.8	100.8
1988	117.7	111.5	102.3	114.2	123.3	103.1	110.6	108.0	104.8
1989	115.4	111.6	101.1	112.7	125.9	102.4	112.8	111.7	109.1
1990	105.9	104.2	100.3	104.4	123.1	101.4	118.2	117.9	116.3
1991	94.7	90.7	101.8	92.2	112.1	102.7	123.6	121.5	118.3

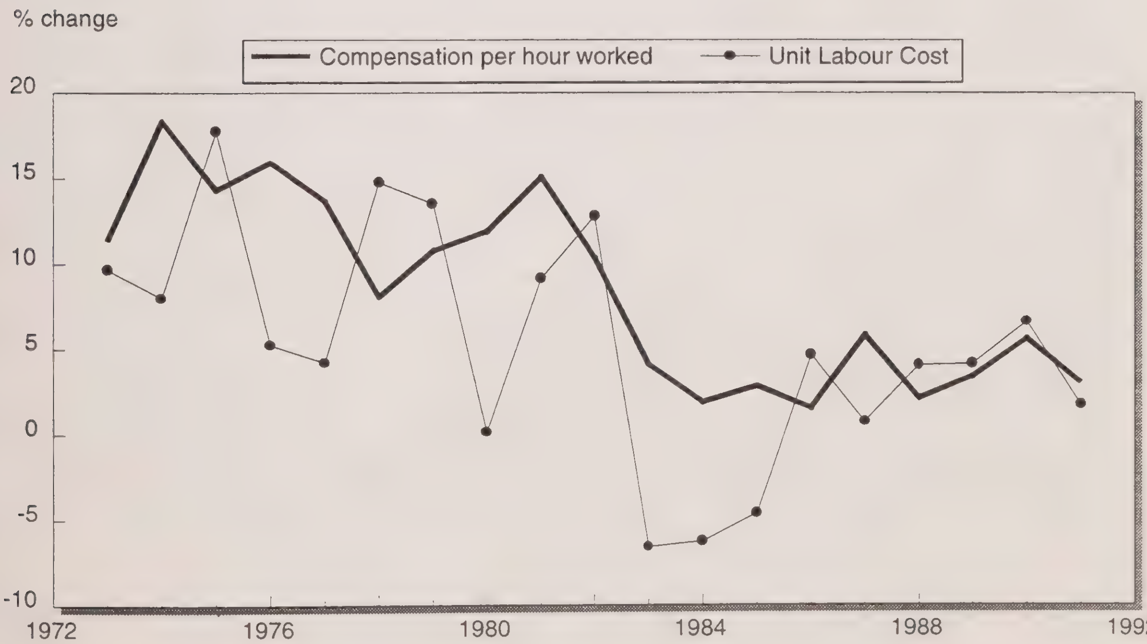


Table 22

Indices of labour productivity and unit labour cost, furniture & fixture industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	97.3	84.3	103.9	87.4	28.3	111.3	33.6	32.4	29.1
1974	85.2	88.6	104.1	92.2	33.8	92.4	38.2	36.7	39.7
1975	80.6	86.5	103.5	89.4	37.1	90.2	42.9	41.4	46.0
1976	88.2	83.7	104.2	87.2	41.7	101.2	49.8	47.9	47.3
1977	81.9	76.5	103.7	79.3	41.6	103.3	54.4	52.4	50.7
1978	89.7	78.7	103.2	81.1	45.8	110.6	58.2	56.5	51.1
1979	88.5	85.9	104.2	89.5	53.0	98.9	61.7	59.2	59.9
1980	82.3	85.6	102.5	87.7	58.4	93.9	68.2	66.6	70.9
1981	91.7	88.5	101.9	90.2	69.8	101.6	78.8	77.3	76.1
1982	69.9	79.8	101.2	80.8	64.9	86.5	81.4	80.4	92.9
1983	79.0	78.8	98.7	77.7	69.4	101.6	88.2	89.3	87.9
1984	85.0	81.6	99.7	81.4	76.0	104.5	93.1	93.4	89.4
1985	94.7	89.9	99.5	89.5	87.1	105.9	97.0	97.4	92.0
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.8	110.9	100.5	111.4	111.8	89.5	100.9	100.4	112.1
1988	97.3	112.2	100.4	112.6	121.8	86.4	108.6	108.2	125.3
1989	96.2	114.1	96.3	109.9	127.2	87.6	111.5	115.8	132.3
1990	90.2	106.4	98.7	105.1	125.2	85.8	117.7	119.2	138.9
1991	74.4	91.2	98.6	90.0	111.6	82.7	122.4	124.1	150.0

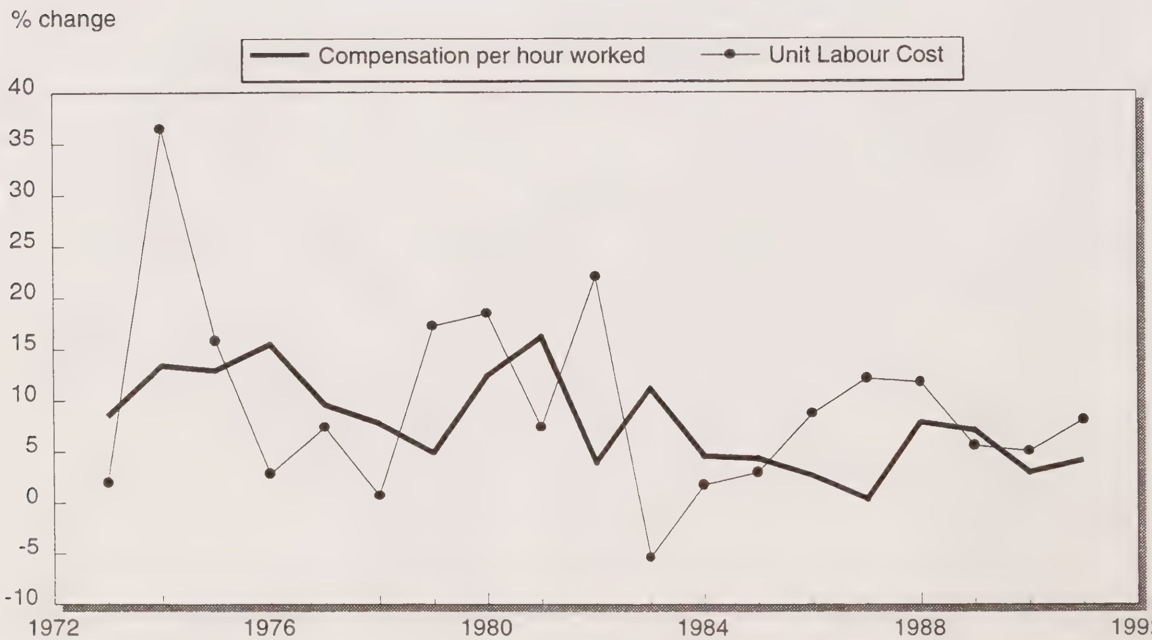


Table 23

Indices of labour productivity and unit labour cost, paper & allied products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	100.3	103.1	103.5	106.7	28.8	94.0	27.9	27.0	28.7
1974	108.6	109.9	102.9	113.1	35.6	96.0	32.4	31.5	32.8
1975	77.3	106.5	93.5	99.6	36.6	77.6	34.3	36.7	47.4
1976	95.3	109.1	98.6	107.6	45.9	88.6	42.1	42.7	48.2
1977	94.2	104.0	102.0	106.0	49.3	88.8	47.5	46.5	52.4
1978	104.1	105.5	107.4	113.2	54.3	91.9	51.4	47.9	52.1
1979	102.8	106.9	101.2	108.1	59.3	95.1	55.4	54.8	57.6
1980	100.7	107.8	106.7	115.0	66.1	87.6	61.3	57.4	65.6
1981	96.7	107.6	100.4	108.1	75.4	89.5	70.1	69.8	78.0
1982	82.9	100.5	99.7	100.2	78.0	82.7	77.7	77.9	94.2
1983	92.8	97.6	100.1	97.7	82.1	94.9	84.1	84.0	88.5
1984	96.1	98.9	100.3	99.2	86.6	96.9	87.6	87.3	90.1
1985	94.9	97.5	100.4	97.9	92.8	96.9	95.1	94.8	97.7
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	106.0	102.0	99.7	101.7	105.4	104.3	103.4	103.7	99.4
1988	106.4	103.1	100.7	103.8	112.0	102.5	108.6	107.9	105.3
1989	102.4	101.8	102.3	104.2	114.7	98.3	112.6	110.1	112.0
1990	99.0	98.0	100.9	98.9	115.9	100.2	118.3	117.2	117.0
1991	95.5	93.8	99.1	92.9	117.4	102.8	125.1	126.3	122.9

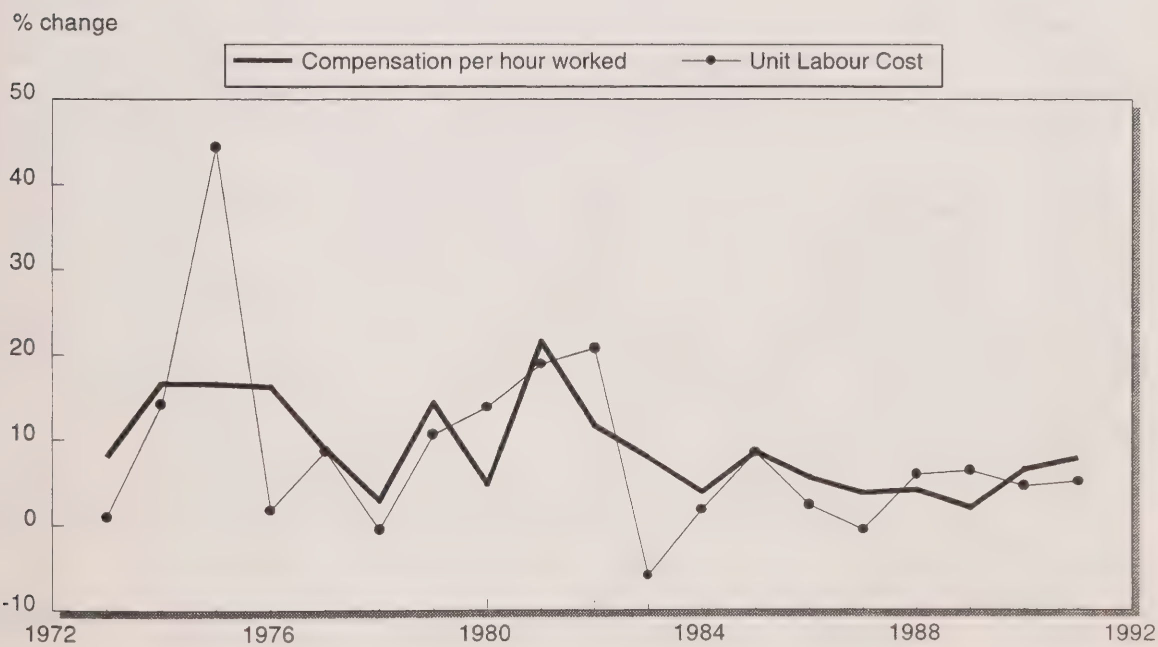


Table 24

Indices of labour productivity and unit labour cost, printing, publishing & allied industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	65.0	77.4	104.6	80.9	24.2	80.4	31.3	30.0	37.3
1974	65.5	78.4	103.7	81.3	27.9	80.5	35.6	34.3	42.6
1975	66.4	78.7	103.2	81.2	31.6	81.7	40.1	38.9	47.6
1976	72.9	79.3	102.3	81.1	35.9	89.9	45.3	44.2	49.2
1977	76.5	78.1	101.6	79.3	38.7	96.4	49.5	48.7	50.6
1978	82.3	81.7	102.4	83.7	43.2	98.4	52.8	51.6	52.5
1979	84.1	85.4	101.3	86.6	48.7	97.1	57.0	56.2	57.9
1980	88.8	89.3	102.5	91.6	56.2	96.9	62.9	61.4	63.3
1981	91.0	89.8	100.5	90.2	64.2	100.8	71.6	71.2	70.6
1982	83.4	89.4	100.8	90.1	69.2	92.5	77.4	76.8	83.0
1983	86.3	89.3	99.8	89.1	75.5	96.8	84.5	84.7	87.5
1984	93.2	92.1	100.4	92.5	82.1	100.7	89.2	88.8	88.2
1985	97.6	95.0	99.9	95.0	90.3	102.8	95.0	95.1	92.5
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.8	103.4	100.3	103.7	107.2	96.2	103.6	103.3	107.4
1988	104.6	108.2	101.1	109.5	121.2	95.5	111.9	110.7	115.9
1989	107.4	114.1	100.7	114.8	132.0	93.5	115.8	115.0	123.0
1990	105.7	114.9	101.4	116.6	139.1	90.7	121.0	119.3	131.6
1991	94.3	108.0	100.7	108.8	137.1	86.7	126.9	126.0	145.4

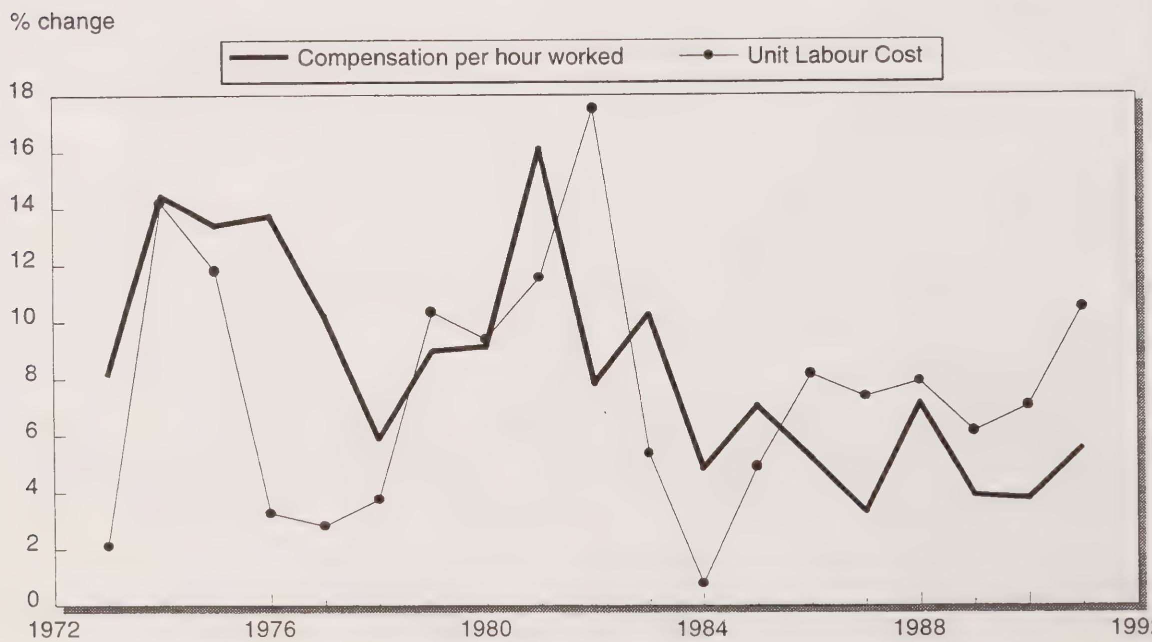


Table 25

Indices of labour productivity and unit labour cost, primary metal industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen- sation	Real GDP per hour worked	Compen- sation per person	Compen- sation per hour worked	Unit labour cost
1973	100.3	112.9	105.3	118.9	31.0	84.3	27.4	26.0	30.9
1974	107.6	118.4	105.5	124.9	36.9	86.1	31.1	29.5	34.3
1975	98.0	116.6	101.3	118.1	41.4	83.0	35.5	35.0	42.2
1976	90.2	113.7	101.1	115.0	45.4	78.4	39.9	39.5	50.3
1977	98.9	115.5	101.6	117.4	50.5	84.2	43.7	43.0	51.0
1978	104.1	118.3	102.0	120.6	55.9	86.3	47.3	46.4	53.7
1979	94.8	122.9	103.2	126.8	63.7	74.8	51.8	50.2	67.2
1980	87.3	124.5	103.1	128.4	72.2	67.9	58.0	56.2	82.7
1981	94.5	120.9	101.5	122.7	81.2	77.0	67.2	66.2	85.9
1982	71.0	109.8	100.2	110.0	84.1	64.5	76.6	76.4	118.4
1983	80.1	102.5	100.0	102.5	85.0	78.2	82.9	82.9	106.1
1984	98.0	105.3	104.0	109.4	95.6	89.5	90.8	87.3	97.5
1985	103.7	103.2	99.4	102.6	98.9	101.1	95.9	96.5	95.4
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	110.5	100.7	100.3	101.0	104.6	109.4	103.8	103.6	94.6
1988	116.4	105.1	102.1	107.4	114.3	108.4	108.7	106.5	98.2
1989	113.0	102.5	100.6	103.1	116.5	109.6	113.7	113.0	103.1
1990	105.1	93.2	103.1	96.1	111.3	109.4	119.5	115.9	106.0
1991	105.3	89.3	101.8	90.9	113.6	115.8	127.2	125.0	107.9

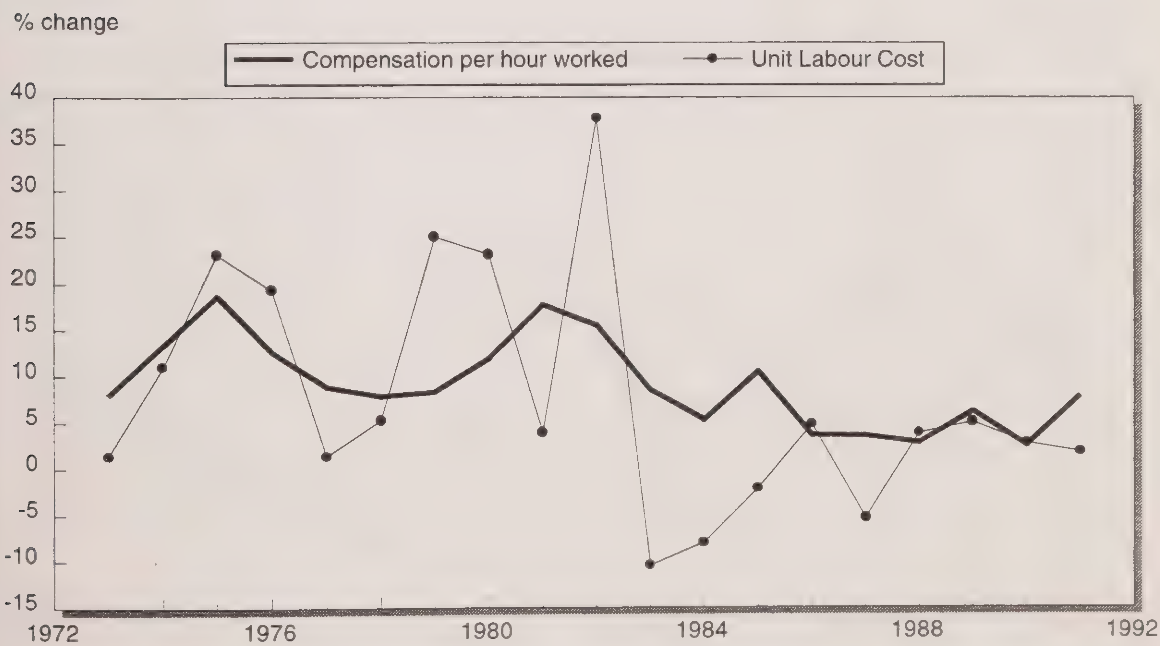


Table 26

Indices of labour productivity and unit labour cost, fabricated metal products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	92.5	99.9	103.1	102.9	34.5	89.9	34.6	33.5	37.3
1974	100.4	106.1	101.6	107.8	41.7	93.1	39.3	38.7	41.5
1975	91.4	104.7	101.4	106.2	46.7	86.1	44.6	44.0	51.1
1976	97.6	106.1	101.3	107.5	53.1	90.8	50.0	49.4	54.4
1977	95.9	103.1	101.4	104.5	56.4	91.7	54.7	53.9	58.8
1978	99.0	105.8	102.1	108.0	61.9	91.7	58.5	57.3	62.5
1979	102.3	110.4	100.5	110.9	70.4	92.2	63.8	63.5	68.9
1980	102.4	109.0	100.5	109.6	76.7	93.5	70.3	70.0	74.9
1981	100.6	106.1	100.2	106.4	84.3	94.6	79.4	79.2	83.8
1982	85.5	94.2	98.9	93.1	82.2	91.8	87.2	88.2	96.1
1983	80.7	87.6	98.2	86.0	81.2	93.8	92.7	94.4	100.6
1984	86.9	87.4	99.3	86.8	83.9	100.0	96.0	96.7	96.6
1985	97.6	94.5	100.6	95.1	93.3	102.7	98.8	98.2	95.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.9	106.5	100.4	106.8	108.2	99.1	101.6	101.3	102.1
1988	108.3	114.0	100.9	115.0	122.7	94.1	107.6	106.7	113.3
1989	112.1	122.1	99.4	121.4	135.0	92.4	110.5	111.2	120.4
1990	105.5	112.8	99.4	112.1	134.3	94.1	119.1	119.8	127.3
1991	93.7	103.6	98.9	102.5	129.1	91.4	124.6	125.9	137.7

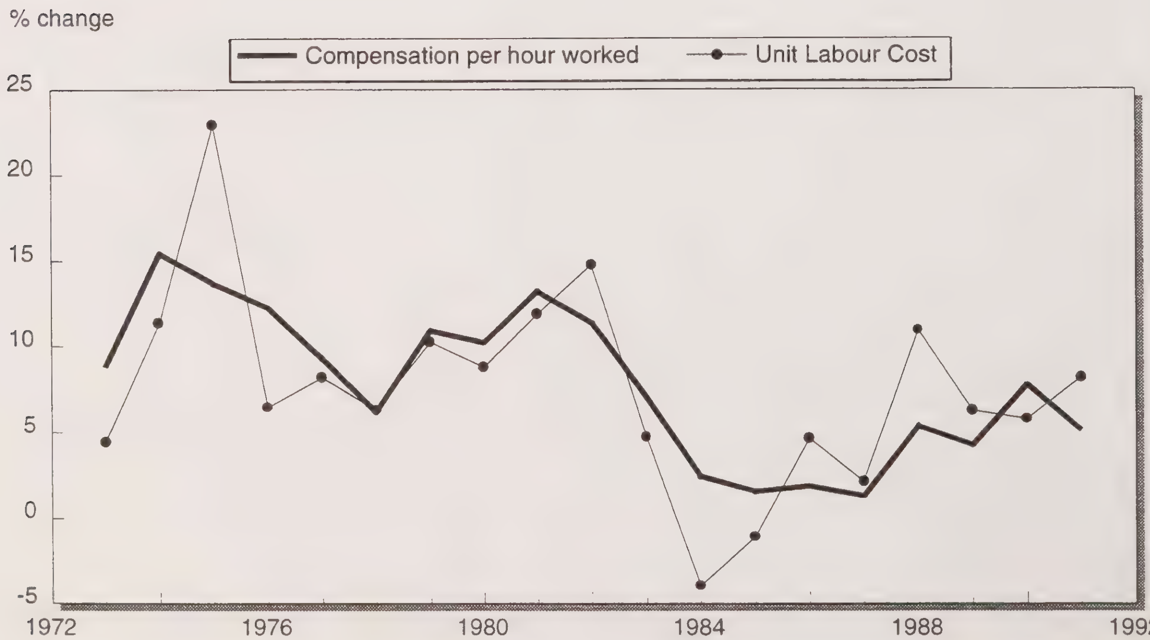


Table 27

Indices of labour productivity and unit labour cost, machinery industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	85.0	91.8	101.9	93.5	30.6	90.9	33.3	32.7	36.0
1974	96.7	100.9	100.7	101.6	38.1	95.1	37.8	37.5	39.4
1975	96.2	107.7	100.4	108.0	45.3	89.0	42.1	41.9	47.1
1976	97.2	104.0	100.3	104.4	49.1	93.1	47.2	47.0	50.5
1977	99.5	103.5	98.9	102.3	53.7	97.3	51.9	52.5	54.0
1978	105.0	105.7	100.2	105.9	59.8	99.1	56.6	56.5	57.0
1979	120.6	114.7	99.7	114.4	71.2	105.4	62.1	62.2	59.0
1980	122.4	121.4	99.2	120.5	83.2	101.6	68.5	69.0	68.0
1981	118.4	118.7	98.4	116.9	93.5	101.3	78.7	80.0	78.9
1982	88.2	100.4	97.8	98.1	86.2	89.9	85.9	87.9	97.8
1983	78.0	89.1	98.1	87.4	78.7	89.3	88.4	90.1	100.9
1984	94.5	93.1	99.6	92.7	86.3	102.0	92.8	93.2	91.4
1985	96.5	95.5	99.7	95.2	92.3	101.3	96.6	96.9	95.7
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	98.0	105.5	101.1	106.7	106.5	91.9	101.0	99.9	108.7
1988	109.4	116.7	100.1	116.8	122.9	93.7	105.3	105.2	112.3
1989	110.5	121.0	99.6	120.6	131.9	91.7	109.0	109.4	119.4
1990	102.1	109.0	100.7	109.8	131.1	93.0	120.3	119.5	128.4
1991	84.4	98.4	99.9	98.4	124.5	85.8	126.5	126.6	147.5

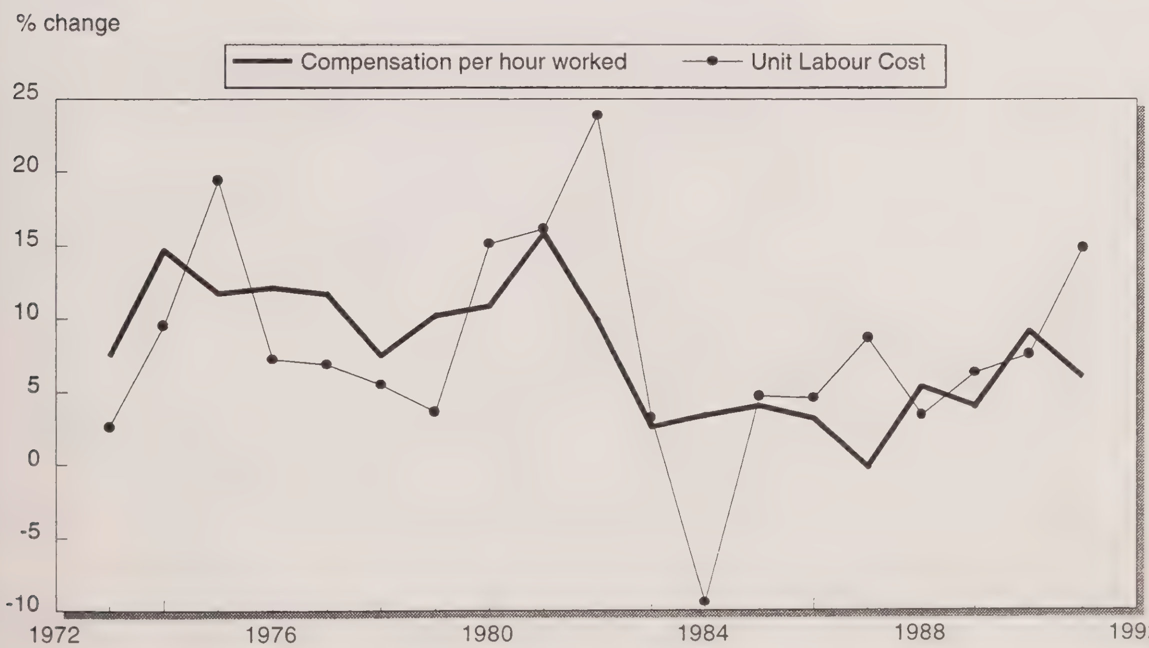


Table 28

Indices of labour productivity and unit labour cost, transportation equipment industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	70.5	86.2	98.8	85.2	26.1	82.8	30.3	30.6	37.0
1974	70.7	85.0	97.1	82.6	28.8	85.7	33.9	34.9	40.8
1975	72.4	79.1	97.5	77.1	30.1	94.0	38.1	39.1	41.6
1976	78.4	82.0	96.4	79.0	35.7	99.1	43.5	45.1	45.5
1977	81.5	83.0	98.3	81.5	40.4	100.0	48.7	49.6	49.5
1978	84.2	88.6	95.7	84.8	46.7	99.3	52.7	55.0	55.4
1979	84.3	93.7	93.5	87.6	52.3	96.3	55.9	59.8	62.1
1980	65.3	87.9	92.8	81.6	53.4	80.0	60.8	65.4	81.8
1981	72.0	87.9	93.6	82.3	62.3	87.5	70.9	75.7	86.5
1982	66.0	80.2	92.2	73.9	61.0	89.3	76.1	82.6	92.5
1983	75.7	80.9	95.4	77.2	67.5	98.1	83.5	87.5	89.2
1984	95.9	91.3	98.5	89.9	82.7	106.7	90.6	92.0	86.2
1985	102.6	98.4	99.0	97.4	94.6	105.3	96.1	97.2	92.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	99.6	101.9	101.3	103.2	105.5	96.4	103.6	102.2	106.0
1988	118.1	108.6	100.3	108.9	117.0	108.4	107.8	107.4	99.1
1989	124.7	112.4	96.7	108.7	123.2	114.8	109.6	113.4	98.8
1990	117.2	105.8	94.2	99.7	120.8	117.6	114.1	121.2	103.0
1991	106.4	97.2	93.8	91.2	118.0	116.7	121.4	129.4	110.9

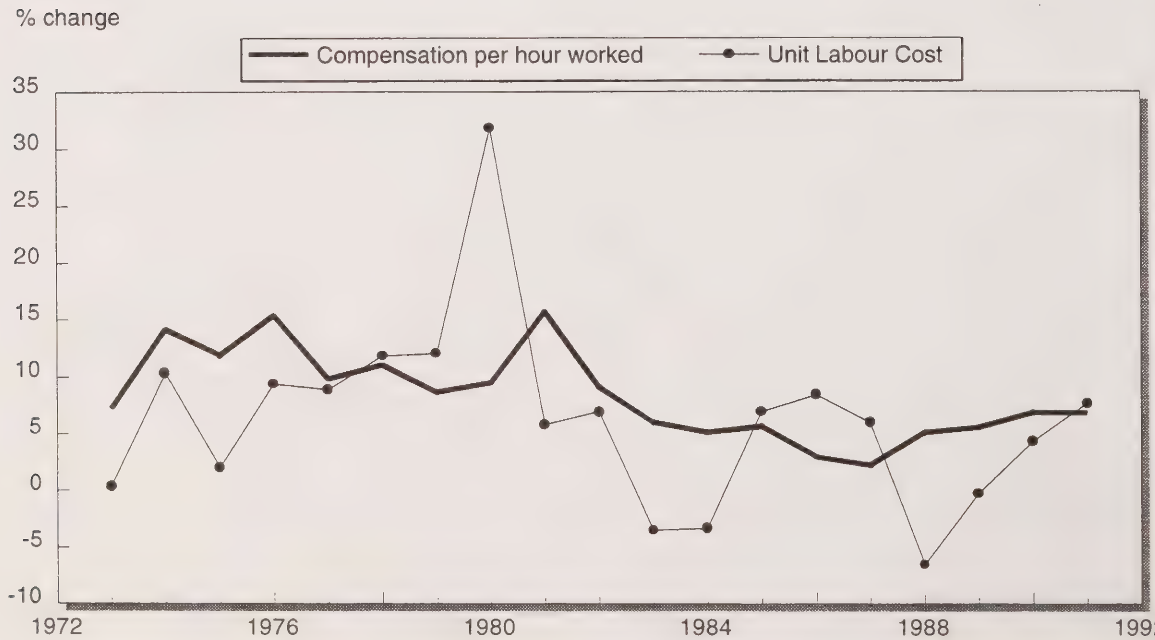


Table 29

Indices of labour productivity and unit labour cost, electrical & electronic products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	47.5	104.6	102.8	107.5	31.0	44.2	29.6	28.8	65.2
1974	49.4	109.1	102.2	111.5	36.7	44.3	33.6	32.9	74.3
1975	44.6	102.4	101.7	104.1	39.3	42.8	38.4	37.7	88.1
1976	47.4	99.4	100.8	100.2	43.1	47.3	43.3	43.0	90.8
1977	47.5	90.8	100.6	91.3	43.3	52.0	47.6	47.4	91.1
1978	47.7	92.9	101.3	94.1	47.6	50.6	51.3	50.6	99.9
1979	57.4	98.6	100.7	99.3	56.5	57.9	57.3	56.9	98.4
1980	64.2	101.9	100.0	101.9	63.9	63.0	62.7	62.7	99.6
1981	72.2	107.7	99.9	107.6	75.7	67.1	70.3	70.4	104.8
1982	66.6	99.3	99.7	99.0	77.9	67.3	78.5	78.7	116.9
1983	66.9	94.6	100.2	94.8	80.7	70.6	85.4	85.2	120.6
1984	86.3	100.5	99.2	99.7	90.0	86.5	89.5	90.3	104.3
1985	95.7	101.4	101.3	102.7	96.5	93.2	95.2	94.0	100.8
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	110.7	106.4	100.9	107.4	111.0	103.1	104.3	103.4	100.2
1988	119.4	111.3	99.9	111.2	120.6	107.4	108.4	108.4	101.0
1989	126.6	111.9	100.7	112.7	125.4	112.4	112.0	111.3	99.0
1990	126.8	104.6	101.0	105.6	124.7	120.1	119.2	118.0	98.3
1991	123.6	96.9	101.4	98.3	123.7	125.8	127.7	125.9	100.1

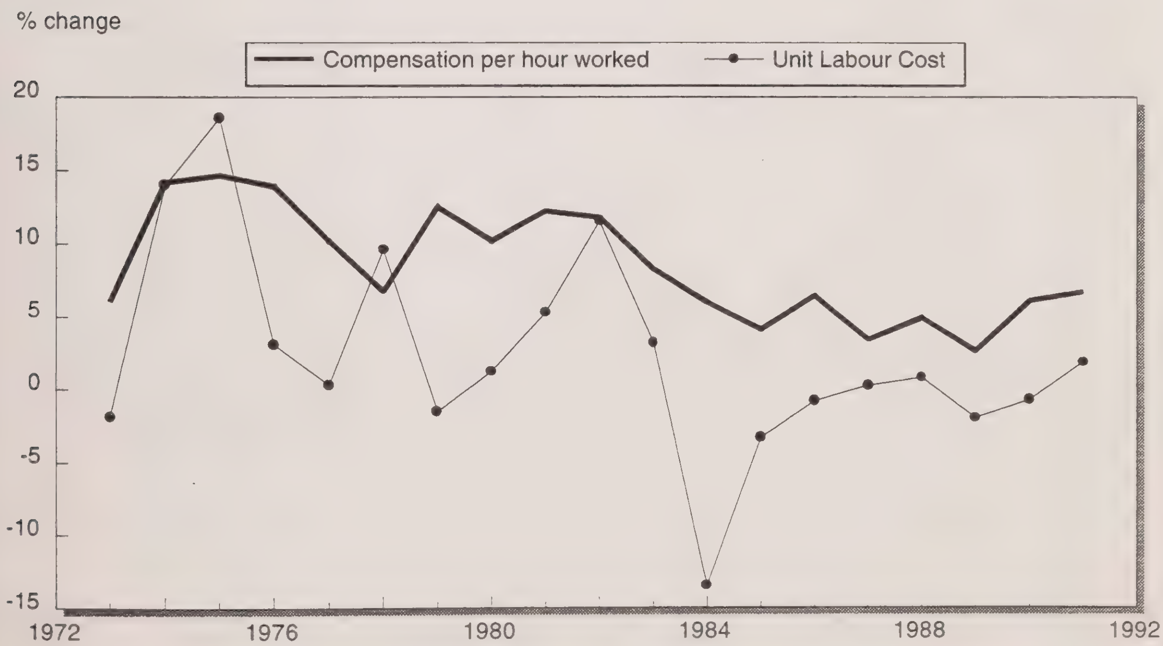


Table 30

Indices of labour productivity and unit labour cost, non-metallic mineral products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	107.1	106.6	104.0	110.8	32.9	96.7	30.9	29.7	30.7
1974	109.4	110.2	103.0	113.5	38.8	96.4	35.2	34.1	35.4
1975	101.9	107.5	103.0	110.7	43.5	92.1	40.4	39.3	42.7
1976	104.8	106.4	101.9	108.4	49.1	96.6	46.1	45.3	46.8
1977	100.8	102.0	102.0	104.0	52.5	96.9	51.4	50.4	52.1
1978	108.1	104.6	101.8	106.4	57.9	101.6	55.3	54.4	53.5
1979	111.8	106.6	101.3	108.0	64.8	103.5	60.8	60.0	58.0
1980	98.2	105.0	99.0	104.0	69.2	94.4	65.9	66.6	70.5
1981	94.5	104.5	98.5	102.9	77.9	91.8	74.6	75.7	82.5
1982	72.4	90.7	97.3	88.2	73.8	82.1	81.4	83.7	102.0
1983	80.2	88.9	99.0	88.0	77.1	91.1	86.7	87.6	96.1
1984	87.8	91.4	99.7	91.2	82.6	96.3	90.4	90.6	94.1
1985	95.8	94.6	99.5	94.2	90.9	101.7	96.1	96.6	94.9
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	109.6	106.2	101.5	107.8	109.7	101.7	103.3	101.7	100.1
1988	111.3	108.1	102.3	110.5	116.6	100.7	107.9	105.5	104.7
1989	108.7	107.2	102.6	110.0	119.0	98.8	111.0	108.1	109.4
1990	97.5	102.2	101.4	103.6	117.6	94.1	115.1	113.4	120.6
1991	82.5	92.3	99.8	92.1	108.8	89.6	117.9	118.1	131.8

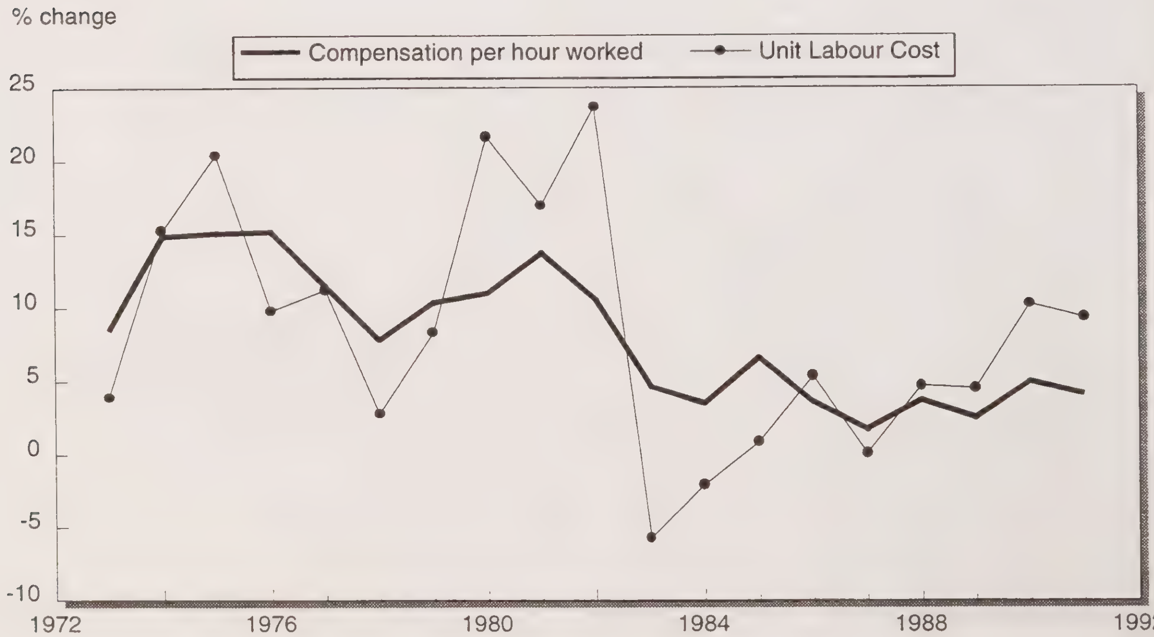


Table 31

Indices of labour productivity and unit labour cost, refined petroleum & coal products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
1973	103.2	104.3	98.9	103.1	28.4	100.1	27.2	27.5	27.5
1974	105.0	115.0	98.4	113.2	35.4	92.8	30.8	31.3	33.7
1975	113.4	113.0	95.9	108.4	41.6	104.7	36.8	38.4	36.7
1976	106.0	112.4	95.1	107.0	46.5	99.1	41.3	43.5	43.9
1977	132.2	119.9	94.8	113.7	54.6	116.3	45.5	48.0	41.3
1978	118.9	137.2	95.6	131.1	64.6	90.6	47.0	49.2	54.3
1979	97.9	126.5	96.5	122.2	65.6	80.1	51.8	53.7	67.0
1980	96.1	131.8	95.5	125.9	75.4	76.3	57.2	59.9	78.5
1981	111.3	153.1	95.9	146.9	100.7	75.8	65.8	68.5	90.5
1982	103.2	146.4	93.9	137.5	116.1	75.0	79.3	84.5	112.6
1983	102.7	125.7	100.6	126.5	111.6	81.2	88.8	88.3	108.8
1984	103.5	114.5	101.4	116.1	107.7	89.2	94.1	92.8	104.0
1985	100.8	111.9	102.6	114.9	107.5	87.8	96.0	93.6	106.6
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	105.3	98.4	102.2	100.5	104.8	104.8	106.6	104.3	99.5
1988	108.0	101.8	98.6	100.4	107.7	107.6	105.8	107.3	99.7
1989	112.7	111.6	99.5	111.0	122.4	101.6	109.7	110.3	108.6
1990	119.8	100.7	99.5	100.2	114.1	119.6	113.3	113.9	95.2
1991	116.9	93.0	99.3	92.4	110.8	126.5	119.1	119.9	94.8

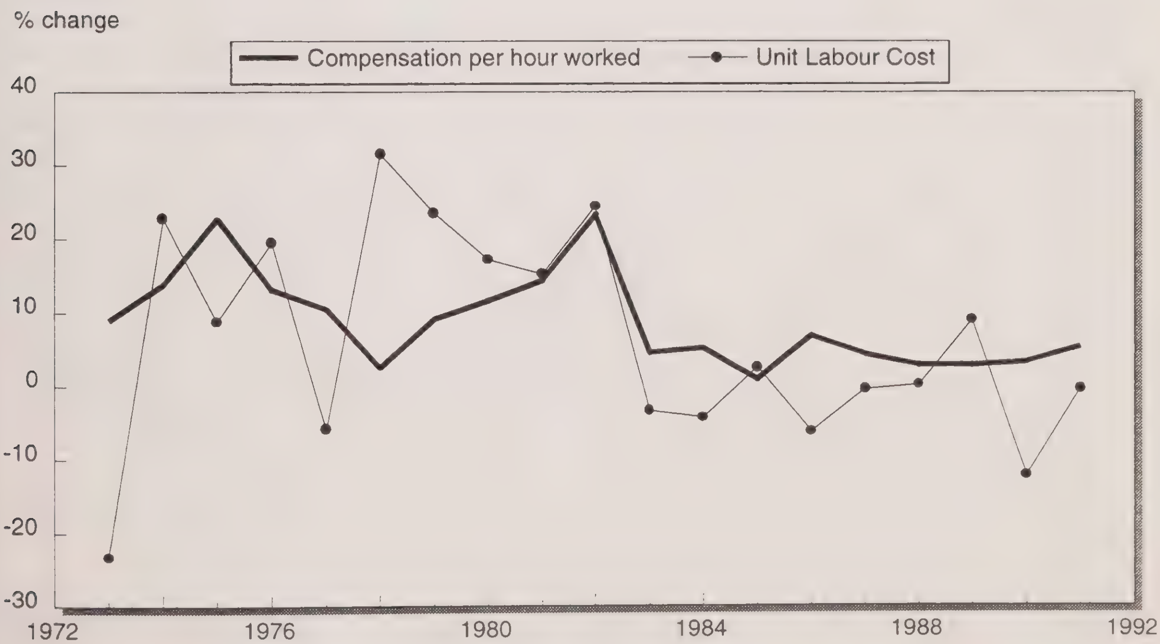


Table 32

Indices of labour productivity and unit labour cost, chemical & chemical products industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	64.3	90.2	101.2	91.2	26.3	70.5	29.2	28.9	41.0
1974	65.3	93.1	100.4	93.5	30.7	69.8	33.0	32.9	47.1
1975	58.5	93.6	100.8	94.3	34.9	62.0	37.3	37.0	59.6
1976	64.7	92.8	95.8	89.0	38.7	72.7	41.6	43.5	59.8
1977	70.5	95.3	100.7	96.0	44.1	73.5	46.3	46.0	62.5
1978	78.7	96.7	100.9	97.6	48.4	80.6	50.1	49.6	61.6
1979	84.4	99.9	99.3	99.2	54.7	85.0	54.8	55.2	64.9
1980	79.4	99.5	99.0	98.5	61.4	80.6	61.7	62.4	77.4
1981	85.9	102.6	98.5	101.1	72.5	85.0	70.6	71.7	84.3
1982	76.4	101.3	97.4	98.7	78.5	77.4	77.5	79.5	102.8
1983	89.9	100.1	99.9	100.0	82.9	89.9	82.8	82.9	92.2
1984	98.4	100.2	100.2	100.4	89.1	98.0	88.9	88.7	90.5
1985	99.5	99.8	99.8	99.5	93.7	100.0	93.9	94.1	94.1
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	107.1	101.7	99.3	101.1	106.4	105.9	104.6	105.3	99.4
1988	114.5	107.4	100.7	108.1	115.5	105.9	107.6	106.9	100.9
1989	118.7	108.0	101.1	109.2	120.2	108.7	111.3	110.1	101.2
1990	118.9	107.5	100.9	108.5	127.0	109.6	118.1	117.0	106.8
1991	111.2	103.5	100.2	103.8	128.2	107.2	123.8	123.5	115.2

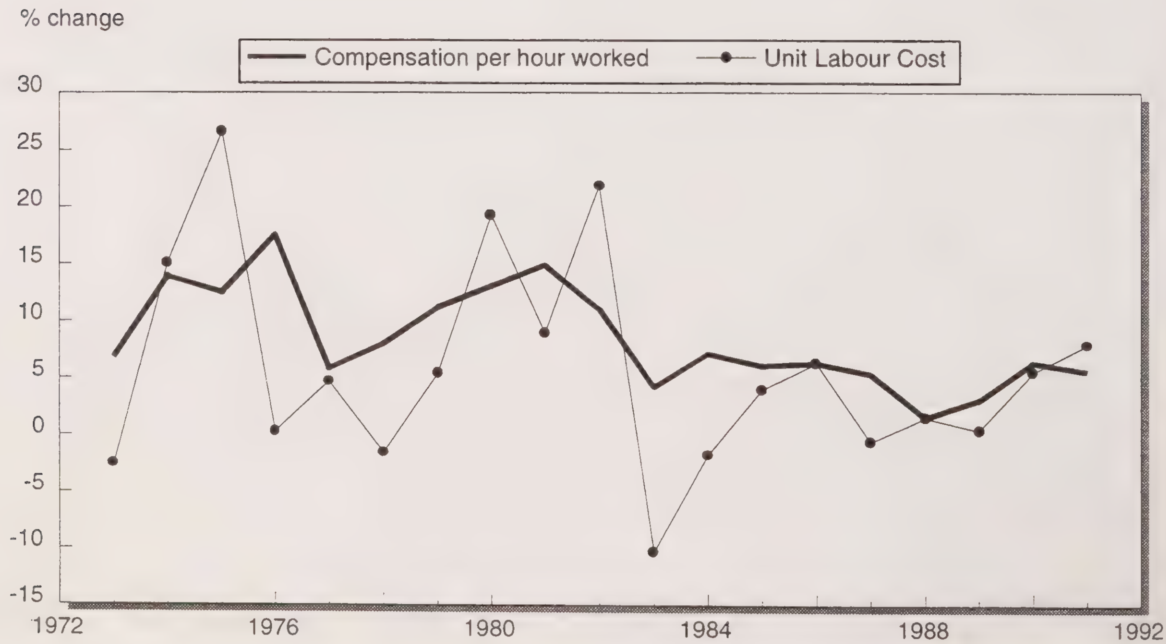
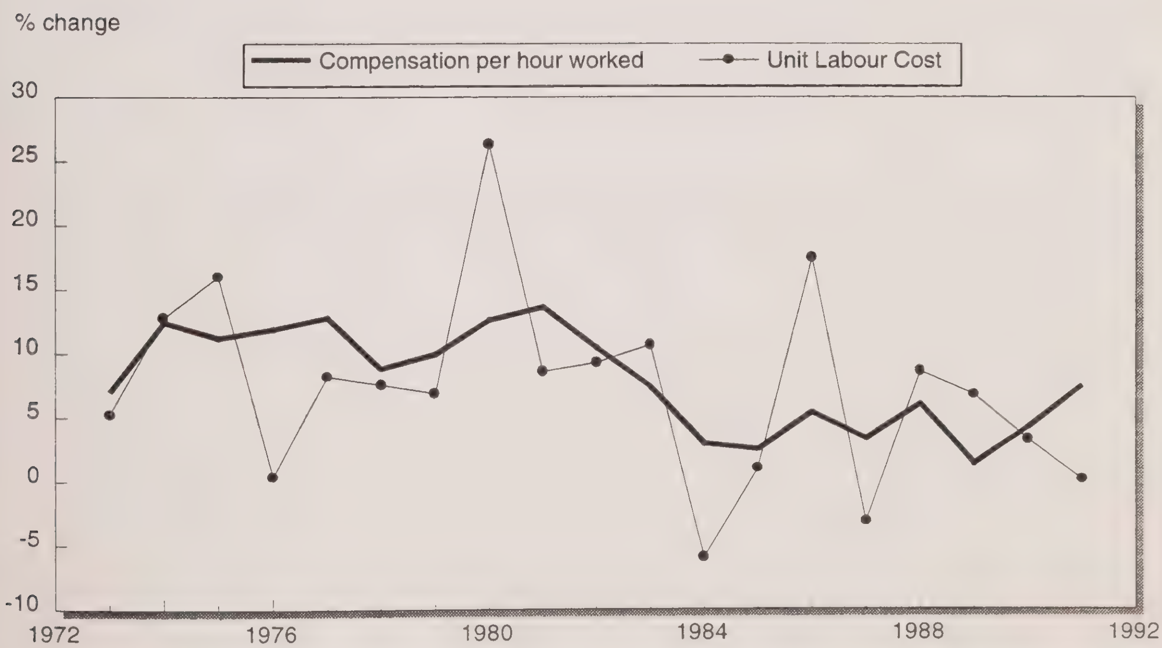


Table 33

Indices of labour productivity and unit labour cost, other manufacturing industries (1986=100)

Year	Real gross domestic product	Persons at work	Annual hours per person	Hours worked	Labour compen-sation	Real GDP per hour worked	Compen-sation per person	Compen-sation per hour worked	Unit labour cost
1973	88.7	90.2	103.6	93.4	29.3	94.9	32.5	31.4	33.1
1974	92.5	94.0	104.1	97.8	34.5	94.6	36.7	35.3	37.3
1975	88.3	94.2	103.4	97.3	38.2	90.7	40.6	39.3	43.3
1976	98.7	95.9	101.8	97.7	42.9	101.1	44.8	44.0	43.5
1977	96.2	89.9	101.6	91.2	45.3	105.4	50.4	49.6	47.1
1978	99.3	92.0	101.3	93.2	50.3	106.6	54.6	54.0	50.6
1979	105.1	94.3	101.7	95.8	56.8	109.7	60.3	59.3	54.1
1980	93.0	94.4	100.9	95.2	63.6	97.8	67.4	66.8	68.3
1981	100.9	97.8	100.9	98.6	74.8	102.3	76.6	75.9	74.2
1982	93.9	91.2	99.5	90.8	76.1	103.4	83.4	83.8	81.1
1983	91.0	90.4	100.4	90.7	81.6	100.3	90.3	90.0	89.7
1984	103.7	93.2	101.4	94.4	87.5	109.9	93.9	92.6	84.3
1985	109.4	95.9	102.4	98.1	93.1	111.5	97.2	94.9	85.2
1986	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1987	104.6	99.4	98.6	98.0	101.3	106.6	101.9	103.3	96.9
1988	109.7	106.9	98.5	105.3	115.3	104.1	107.9	109.5	105.2
1989	109.1	108.5	101.7	110.4	122.5	98.9	112.9	111.0	112.2
1990	108.2	106.7	101.7	108.5	125.4	99.7	117.5	115.6	115.9
1991	109.8	100.8	101.7	102.6	127.3	107.0	126.3	124.2	116.0



APPENDIXES

1 - Basic Concepts and Methods

2 - Sources of Data

3 - Aggregation Parameters for Productivity Measures

4 - Quality Rating of Productivity Estimates and Related Data

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APPENDIX 1

Basic Concepts and Methods

Ideally, a productivity index is one that takes into account all paid resources that are used as inputs into the production process. A comprehensive measure, such as this, is called a *total factor*, or, alternatively, a *multifactor* productivity index. This is the focus of Part 1 of this publication. Productivity indices that take into account only a subset of the inputs such as, for instance, labour productivity indices, are called *partial* productivity indices. Labour productivity indices are presented in Part 2 of this publication. Part 2 also includes estimates of unit labour costs by industry.

The labour productivity estimates have a longer history than the rather recent multifactor productivity estimates. Consequently, they were not derived as partial indices of the multifactor productivity indices and they thus require a separate methodological description.

In particular, the labour productivity indices are based on a Laspeyres measure of real gross domestic product by industry which is not used in the multifactor productivity accounts. Hence, this appendix presents separately the basic concepts and methods used in the labour and the multifactor productivity accounts.

In the application of the concept of productivity, inputs and outputs must be clearly identified. They may refer to the entire Canadian economy and/or to various components of the economy. These components, in the Canadian System of National Accounts, are either *sectors* or *industries*. The productivity indices refer only to the productivity of the resources used by the *business sector* of the economy. In the Canadian System of National Accounts, the business sector "encompasses that group of transactors who produce goods and services for sale at a price which is calculated to cover costs and yield a profit..."[1]. An industry is defined, in the National Accounts, "as a group of operating units [establishments] engaged in the same or similar kind(s) of economic activity, e.g., coal mines, clothing factories, department stores, laundries"[2]. Industries include both business and non business establishments but can be sectored to include only business establishments. Both the labour and the multifactor productivity indices presented in this publication refer, either explicitly or implicitly, to business establishments only.

The productivity of the government sector can not be calculated at this time in the framework of the Canadian System of National Accounts. The output of non-business sector industries is difficult to measure because it is not normally sold on the market. This means that in general, output prices are not available for this sector. The conventional measure of real output for non-business sector industries is therefore constructed by deflating the value of output with input prices. By convention (for lack of a better alternative), this amounts to measure the real output of

1. Robert B. Crozier, *National Income and Expenditure Accounts, Volume 3, A Guide to the National Income and Expenditure Accounts, Definitions-Concepts-Sources-Methods* (catalogue 13-549, 1975, p. 101).

2. *The Input-Output Structure of the Canadian Economy, 1961-1981* (catalogue 15-510, p. 18).

the government sector as being equal to its primary input use. As a consequence, the growth in output cannot diverge from the growth in inputs as required for a meaningful productivity measure[3].

1 - Labour Productivity and Unit Labour Costs

1.1 - Labour Productivity

The labour productivity measure is *real GDP per hour worked*. This indicator is constructed as a ratio of real output to labour input, and is presented in index number form.

Although labour input is an important determinant in the level of output, it is not the only one. Other inputs also contribute to the production process. Partial productivity indices that do not take these inputs explicitly into account are therefore subject to changes in these inputs as one of the component of the productivity ratio, namely the output level, is partly determined by these other inputs. Hence, a partial productivity index may rise through time either because these other inputs are used in larger quantity or because the efficiency of the production process improves or both. It follows that partial productivity indices such as the labour productivity indices are not precise indicators of overall productive efficiency.

1.2 - Output

The concept of output used in labour productivity measurement is the constant price Gross Domestic Product at factor cost by industry (excluding Government royalties on natural resources and rents of Owner-occupied dwellings). The output measures are calculated with 1961 prices for the period 1961 to 1971, with 1971 prices for the years 1971 to 1981, with 1981 prices for the years 1981 to 1986. Estimates in subsequent years are calculated with 1986 prices. These series were then rescaled to correspond to a 1986 reference year (i.e. 1986=100) for convenience, as 1986 is the base year currently in effect in the Canadian System of National Accounts. The rates of growth in the original series are not affected by the choice of reference year. A more complete description of the output measures is found in *The Input-Output Structure of the Canadian Economy 1961-1981* (Catalogue 15-510) and in *The Input-Output Structure of the Canadian Economy in Constant Prices, 1961-1981* (Catalogue 15-511).

1.3 - Labour Input

In principle, labour input should cover all labour services expended to produce a given output. This report presents one measure of labour services: the hours worked. This measure does not take into account the changing quality of labour input as is the case when measuring multifactor productivity. But the underlying estimates of persons at work and on-hours worked are the same in both set of productivity estimates. Thus, the aggregate labour inputs of different classes of labour are obtained by adding the number of hours worked across classes.

Persons at work denote all *paid* and *other-than-paid* persons engaged in the production of output. Other-than-paid workers include self-employed workers and unpaid family workers.

3. Further detail on the industry coverage of the productivity measures in this publication can be found in Appendix 3.

Hours worked are the sum of hours worked spent at the place of employment by persons at work, and therefore differ from a measure of "hours worked paid" by excluding vacation time, holidays, time lost due to illness, accidents, etc.

1.4 - Labour Compensation

Labour compensation is a measure of the value of labour services engaged in the production process. It includes all payments in cash or in kind by domestic producers to persons at work as remuneration for work, including wages, salaries and supplementary labour income of paid workers, plus an imputed labour income for self-employed workers. Statistics on labour compensation reported here represent the most comprehensive labour cost data available for all industries at the present time since they include both cash payments and supplements and cover all remunerated persons at work.

The estimate of the value of labour services of self-employed persons is an imputed value. The imputation is based on the assumption that the value of an hour worked by a self-employed person is the same as the value of an hour worked by an average paid worker in the same industry. This assumption is based on the premise that labour services are contracted on a temporal basis, and a measure of labour compensation should not reflect returns on investment or risk taking. An adjustment is made in the case of self-employed persons such as doctors, dentists, lawyers, accountants and engineers. In these cases, the average earnings of paid workers in the same industry tend to be lower than the earnings of the self-employed workers. Although self-employed workers are in majority in the industry, the imputation of earnings for these workers at the average rate in the industry tends to underestimate the income of the self-employed. In this case, direct evidence on average labour income of these workers is introduced.

Unpaid family workers, while not directly recompensed for their services, are not a free resource, and their contribution is reflected in the net income of the firm where they are employed. However, no labour income is imputed to unpaid family workers. There is no valid basis for measuring the value of their services, and it is judged that less error is generated by their exclusion from measures of labour compensation than by imputing labour income to them at the same rate as paid workers. The number of unpaid family workers is insignificant in most industries.

1.5 - Unit Labour Cost

Unit labour cost is the ratio of labour compensation to real GDP. It is a measure of the cost of labour per unit of real output. Unit labour cost can also be viewed as the ratio of average compensation to labour productivity; thus, unit labour cost will increase when average compensation grows more rapidly than labour productivity.

1.6 - Absolute Values

All time series in this report are presented as indices taking a value of 100 in 1986. This form emphasizes relative change, as opposed to levels, as being important in the construction of productivity measures and related cost series. One can reconstruct the absolute values underlying the indices of hours worked, real gross domestic product and labour compensation. These absolute values are of some interest as they indicate the level of those series.

Nevertheless, the growth rate of the series is the same whether it is calculated from the index or the absolute values.

Table 1 gives the absolute values underlying the indices for the year 1986. To calculate the absolute values corresponding to the published indices the following procedure can be followed:

$$\frac{\text{Index}}{100} \times \text{1986 value from Table 1}$$

The measurement of employment, output, and the other series mentioned above are subject to some, usually indeterminate, margin of error. These errors usually have a larger impact on the level of the estimates than on their growth rates. While such statistical errors will also have some effect on measures of relative change, it can be expected that their effect will be more serious when comparisons of absolute levels are attempted.

Table 1

Absolute values of labour productivity and unit labour cost, 1986

Industry Title	Real gross domestic product	Hours worked	Labour compensation
	$'000,000	000,000	$'000,000
Business sector industries	335,673	15,298	225,727
Business sector - excluding agricultural and related services industries	324,616	14,216	220,196
Business sector - services	173,374	8,993	126,868
Business sector - goods	162,299	6,305	98,859
Agricultural and related services industries	11,057	1,082	5,531
Manufacturing industries	86,789	3,341	56,919
Construction industries	28,082	1,242	23,449
Transportation and storage industries	20,254	856	14,857
Communication industries	13,248	372	7,628
Wholesale trade industries	23,312	1,066	17,128
Retail trade industries	28,269	2,343	23,949
Community, business and personal services industries	52,119	3,286	41,921

2 - Multifactor productivity

2.1 - Multifactor Productivity in a Nutshell

Although the partial labour productivity indices described above are appropriate for many analytical uses, they do not describe exhaustively the sources of economic growth. This is the case because measured changes in output per unit of labour input are not necessarily attributable to the contribution of labour alone, but also to the contribution of other productive resources and to the effectiveness with which all are combined and organized for production.

On the other hand, the multifactor productivity accounts intend to measure the performance of the Canadian economy in production activities by taking the contributions of all productive resources into account. It is assumed that resources are optimally allocated between the various production activities so that the object of the performance indicators is solely to reveal the technical *efficiency* with which the available resources are used in each of these production activities or groups of activities.

In general, productivity gains are measured in a residual fashion as the growth in output not accounted for by the growth in production factors explicitly listed in the chosen formula. Multifactor productivity measures output per unit of all factors of production combined (such as labour, capital, materials and services used as inputs in the production of goods and services). Consequently, multifactor productivity does not reveal the contribution of the production factors but the joint effects of technical progress, economies of scale, and other factors not explicitly taken into account.

This publication presents two complementary categories of multifactor productivity indices. One category takes into account only the direct productivity gains made by an industry without considering the indirect productivity gains made by its suppliers. The other looks at the productivity gains made in the production of the goods and services of an industry by taking into account the productivity gains made by all industries which contributed directly and indirectly to that production. This measure basically consists in a measure of productivity by product category rather than by industry.

The first category of indices, based on the most usual concept of multifactor productivity, measures the productivity gains taking place within an industry, from the point of view of that industry taken in isolation from the rest of the business sector of the economy. The index measures the growth in the *gross output* of an industry unaccounted for by the growth in all of its factors of production; that is, both the inputs called primary, which are the labour and capital inputs, and the intermediate inputs, which are the materials and services purchased from other industries. This index does not take into account the productivity gains which take place in the industries which produce these intermediate inputs[4]. We will refer to this index as the industry index. Because the industry index does not account for the productivity gains realized in other industries, it can be viewed as a tool to assess productivity gains in a static partial equilibrium framework.

The second category of productivity indices takes into account the productivity gains realized in the upstream industries supplying intermediate inputs[5]. The index measures the growth in the output of an industry unaccounted for by the growth in all its primary inputs as well as by the growth in the primary inputs used in the production of its intermediate inputs by its direct and indirect industry suppliers. In that perspective, the interindustry productivity index takes into account all the primary inputs which have been used in *the business sector as a whole* to produce the goods and services of a given industry. In other words, each industry is viewed as an integrated component of the business sector of the economy rather than as an isolated entity. The interindustry indices can thus be considered as estimates of multifactor productivity gains in a static general equilibrium framework.

4. Except in variant of this index for intermediate inputs originating from the industry itself as will be explained below.

5. The concept and the empirical estimates were first introduced by T.K. Rymes and A. Cas in a study done for Statistics Canada between 1983 and 1985 and published later. See Cas A. and T.K. Rymes (1991), *On Concepts and Measures of Multifactor Productivity in Canada, 1961-1980*, Cambridge University Press, New York. However, contrary to Rymes and Cas, we include the capital stock in the primary inputs rather than in intermediate inputs.

Both measures of productivity are useful. For instance, in an effort to assess the performance of an economy as a whole in the production of some bundle of goods, it would be inappropriate to consider the declining industries with low productivity gains without also looking at the performance of the industries supplying them with goods and services. The latter industries, which may benefit from important productivity gains, may also be strongly dependent on the low performance industries for the sale of their output.

2.2 - The Concept and Measurement of Multifactor Productivity

The *level* of multifactor productivity is a ratio between the level of production of industries and the quantity of all inputs they use. Although there may be alternative ways to compute the productivity ratio, all of these consist in combining all the goods and services produced into a single *aggregate output index* and, likewise, all of the production factors used into a single *aggregate input index*. The aggregation of the goods and services produced or used in the production process requires that these goods and services be measured in some common units. Similarly to the weights and measures in physics, index numbers use the relative value of the goods and services at some specific point in time as the common unit of measure. They are in fact weighted averages where each good/service is attributed a weight according to its contribution to the value of the aggregate of which it is a part of. Thus, the greater the nominal value of the good/service, the larger share it will have in the aggregate[6]. The multifactor productivity index *level* is computed as the ratio of the aggregate output index to the aggregate input index. Productivity *growth* is positive if the aggregate output index grows faster than the aggregate input index. Productivity decreases in the opposite case.

For empirical applications, some choices have to be made on how to actually measure inputs and outputs. The most widespread choice at the industry level is the *gross output* measure. The gross output of an industry is the aggregate volume of all goods and services produced and work done by the industry. Gross output can be defined as either including or excluding intra-industry sales as will be discussed further below.

Correspondingly, on the input side, the measure of the index has to be inclusive of all used (and measurable) inputs which can be classified into two broad categories: (1) *intermediate* inputs which are comprised of the many goods (raw materials) and services purchased by the industries, and (2) *primary* inputs including labour inputs, capital inputs, and natural resources. More precisely, intermediate inputs are considered to be those inputs which are produced and are consumed during the same period (usually a year) by the business sector. The primary inputs[7] are supplied from other sectors of the economy such as the household sector. As discussed further below, imports and a few other variables can also be included in the set of primary inputs.

In the estimation of the multifactor productivity indices, a more detailed breakdown of both the inputs and outputs by commodity were used as described in Appendix 3. The more

6. This can be established more formally as the Divisia aggregation formula for a twice differentiable linearly homogeneous production function under competitive market conditions and profit maximization. The time continuous Divisia index is approximated by the chained Törnqvist index.

7. Capital goods are commodities produced by the business sector like intermediate inputs. However, they are accumulated only if savings occur. Capital goods are supplied to the business sector at the beginning of each period by the households which are the asset holders of the economy. In addition, they are excluded from the intermediate input set on the grounds that they are, by definition, not totally consumed during the period in which they have been produced.

disaggregated (and consequently more homogeneous) set of commodities used improves the quality of the measured productivity indices and presents a definite advantage over the more aggregated (and more heterogeneous) set of commodities usually used by other investigators. However, due to statistical limitations, natural resources are not presently included in the input set. It is hoped that natural resources will be included in the future as estimates of their prices and uses become available. It is believed that this data shortage has implications mostly for the quality of estimates of resources industries but that it has little impact on the estimates of other industries.

The multifactor productivity indices have an important advantage over the partial labour productivity indices. This advantage stems from the inclusion of all the major factors contributing to the growth of output in the economy. Output growth is thus accounted for by increases in productive capacity, by a greater use of various services and goods purchased by industries (including energy) and by the growth in labour input. As mentioned above, output growth which is not accounted for by the growth of inputs is called productivity. Therefore, the more detailed and inclusive is the list of production factors entering into the estimates, the more the growth in output can be "explained".

The inclusion of all production factors in the computation of productivity indices does not preclude the computation of meaningful indices of partial productivity. However, in order to analyze and to explain the partial productivity of any contributing production factor, one must first express its productivity in relation to the contribution of the other production factors. For instance, the index of partial labour productivity may have increased because the quantity of equipment, raw materials, and energy used per unit of labour have increased. Only when the contribution of these other factors have been netted out can the partial labour productivity be meaningfully related to factors such as education and experience. Multifactor productivity presents a net advantage on this count compared to labour productivity, precisely because it allows the decomposition of increased labour productivity between the portion which comes from the contribution of the other production factors, and the portion which comes from factors explaining the increased efficiency of labour, such as education. The labour productivity indices presented in this publication do not allow such a decomposition.

2.3 - Which Resources and How are they Measured?

Unemployed resources are excluded from the computation of productivity. Thus, for example, the labour input is measured with hours worked rather than with the available labour force. The productivity indices, consequently, do not measure the performance of the economy as a whole which is often reduced by the non-utilization of available resources. Rather, the productivity indices presented here intend to track the evolution of the technical performance of the production processes which would obviously not be well captured if unemployed resources were taken into account.

On the other hand, resources engaged in the production process may not be fully employed as is often the case in economic downturns. Labour hoarding is a classical example: in response to decreasing demand for its product, an establishment may not lay off its employees for various reasons such as separation costs and the cost of training new employees when operations expand later on.

No adjustment for capacity utilization of inputs is explicitly made to the multifactor productivity indices with one important exception. An adjustment is made to take into account the capacity

utilization rate of capital by calculating the cost of capital, that is, its share in the index of combined inputs, in a residual manner rather than by calculating it using the user-cost-of-capital approach (interest rates, depreciation rates, and other variables affecting the price of capital services)[8].

However, this correction does not fully eliminate the cyclical fluctuations of the indices and, consequently, does not reveal the trend followed by technical progress. This may be due to the fact that capital is not the only quasi-fixed factor. We just mentioned above the phenomena of labour hoarding. Short run disequilibrium may also act on the measure as well as scale economies and errors in the data.

However, over the long run, that is from peak to peak in economic activity, the indices do in fact reveal the increased productivity associated with technological possibilities, either in the form of technical progress or through a better use of all available technologies.

2.4 - Alternative Measures of Multifactor Productivity

2.4.1 Two categories of productivity measures. An industry rarely carries out all of the transformations from basic materials to final products. The automobile industry, for instance, uses steel as an intermediate input, which has been produced by the steel industry. Rarely are automobile producers involved in steel manufacturing. The production of steel is part of the total transformation processes involved in the production of automobiles but it is not part of the transformation processes of the automobile industry itself. Thus, if one is interested in the productivity of all the production processes involved in the production of the output of the automobile industry, one must *integrate*[9] *the productivity of activities of all industries* having participated in such production. This would embrace the industry directly involved in the manufacturing of automobiles (the automobile industry) as well as those industries indirectly involved in supplying the automobile industry with all the necessary parts, materials and services (all the "upstream" industries, such as the steel industry). The *interindustry* productivity estimates pertain to the productivity of groups of industries linked to each other by the flow of intermediate goods and services. Since this measure covers all industries, it can be considered as the productivity of the economy in producing a given bundle of goods or as a product group index of productivity.

From the point of view of the industry, the sources of inputs, whether intermediate or primary, do not matter. From that perspective, inputs are considered as given to the industry although for the economy as a whole these resources had to be either (1) produced by other industries, (2) imported or (3) supplied by households in the form of capital and labour. From that point of view, the industry, *as an isolated entity*, is the universe over which productivity is computed. This is the essence of the *traditional view* on productivity.

The new *interindustry* perspective on productivity is equivalent to the perspective of an observer whose concern lies in the efficiency with which the scarce resources of the *economy as a whole* are being used. One may, in particular, be interested in the efficiency with which an industry, as a

8. See Berndt, E.R. and Fuss, M.A., "Productivity Measurement with adjustments for variations in capacity utilization and other forms of temporary equilibrium", *Journal of Econometrics* 33 (1986) 7-29, North-Holland.

9. For a full discussion of the concept of integration in relation to productivity measurement, see Durand R., "Aggregation, Integration and Productivity Analysis: An Overall Framework", *Aggregate Productivity Measures 1989*, Statistics Canada, (catalogue 15-204), pp. 107-118.

component of the business sector rather than as an isolated entity, uses the scarce primary resources available to the business sector of the economy, whether directly or indirectly, by purchasing goods and services from other industries. The latter industries use both primary and intermediate inputs but the intermediate inputs they use also originate from upstream industries so that, going through all interindustry transactions, all intermediate inputs can ultimately be accounted for by uses of primary inputs.

In the example of the automobile industry, the inputs are capital and labour and the intermediate inputs it purchases, such as steel. The inputs of the steel industry include capital and labour inputs and the intermediate inputs it purchases, such as steel ingots. In turn, the steel ingot industry uses its own inputs including capital, labour, as well as iron ore from a mine it owns. When considering the interindustry set of inputs, we know that it takes capital and labour in the ingot industry to extract the ore and to produce ingots, and that it takes the capital and labour of the steel industry to transform the ingots into steel. Downstream, the automobile industry also needs capital and labour to transform the steel into automobiles. Thus, the set of inputs in the interindustry measure of productivity now includes the capital and labour services used directly and indirectly in the production of automobiles. In this perspective, the interindustry concept *integrates* the contribution of upstream industries to the production of its output bundle.

The real degree of vertical integration of industries is constantly changing through the years. It is also quite different from one country to another. Therefore, the comparisons of productivity growth through time or across countries based on the conventional industry indices are always limited by the changing degree of integration through time or the varying degree of integration across countries. At a very disaggregated level, this statistical instability of the traditional productivity measures may become important. Indeed, the industries' establishments may not only be more or less vertically integrated but they can also migrate from one industry to another as their output mix changes through time. By vertically integrating all industries in their calculation, the interindustry productivity indices become insensitive to such "statistical" influences, given these indices an advantage over the industrial measures. Indeed, they measure the productivity of the same production processes whatever the industries in which these processes took place.

From the point of view of the individual interested in the global performance of the business sector as a whole *in the production of some group of commodities*, in particular for international trade studies, the interindustry measure may prove to be more interesting than the traditional industry measure. Indeed, it takes into account not only the efficiency with which various inputs are combined within some industry to produce a given group of outputs but also the efficiency of the industries supplying the intermediate inputs. Thus, to take the example of the motor vehicle industry, this measure takes into account not only the efficiency of the assembly plants, but also the efficiency of the plants producing the auto parts and other raw materials, even including the production of basic minerals and other industries' output located far upstream in the chain of production. The national economy may possess very efficient assembly plants as compared to foreign plants but still remain disadvantaged on the international automobile market because of the relative inefficiency of the industries which "feed" its motor vehicle industry.

In fact, it seems advantageous to use both measures of productivity as they provide complementary information. The industry measure isolates the efficiency of the motor vehicle industry segment in the production of automobiles. The joint use of both measures allows the analysis of the overall efficiency of production processes (vertically integrated industries) as well as the efficiency of each of its (isolated industry) segments.

2.4.2 Two concepts of gross output. As mentioned above, in addition to the standard gross output measure derived from the input-output tables, one may adopt another production concept for the purpose of estimating multifactor productivity: the gross output net of all intra-industry flows. According to Gullickson and Harper[10],"...removing intra-industry transactions assures that changes in vertical integration through time in the census data do not bias the estimates." This advantage refers only to intra-industry integration while the interindustry measure introduced above possesses the same advantage over both intra- and interindustry sales.

The concept of net-gross output[11] has the further advantage of smoothing the aggregation process. According to the traditional approach, the concept of gross output is maintained at all levels of aggregation except at the total business sector level where the productivity measure based on value-added is considered. Even for broad aggregates such as goods industries and services industries, multifactor productivity measures are defined on gross output while productivity of the business sector is defined on value-added. The measure of output is therefore abruptly changed from gross output for broad aggregates to value-added for the total. In contrast, the net-gross output measure converges gradually towards value-added as, when moving to broader aggregates, intermediate inputs are progressively reclassified from *interindustry* sales to *intra-industry* sales and subtracted from gross output. As a counterpart, the concept of net-gross output has the disadvantage that productivity estimates depend on the level of aggregation as the more aggregated so the more integrated they are. Detailed industry productivity estimated, therefore, cannot be compared to aggregate estimates.

2.5 - Aggregate Business Productivity

The discussion of the various concepts has hitherto been made with reference to the industry or commodity group as the main subject. What about multifactor productivity measures for the total business sector? What impact has the aggregation level on the definition of output and inputs? The answers to these questions are the main focus of this section.

If we wish to measure the productivity of the business sector in producing goods and services to be sold outside the sector, the industrial measure of multifactor productivity based on gross output is inadequate. The sum of the gross outputs of all industries in the business sector corresponds to much more than the outbound production as it includes all goods and services bought by other industries and used as intermediate inputs in the production of other goods and services. This is why the aggregate productivity index on gross output is not calculated in the framework of Statistics Canada's productivity program.

The question is now: what are the appropriate measures of productivity at the aggregate level? First, let us consider the net-gross output model, where intra-industry sales are netted out from both output and inputs. In this model, the output includes the production of goods and services delivered outside the sector and the inputs include all the resources available to the business sector, that is its primary inputs (labour and capital) and the inputs originating from the other sectors of the economy and from outside the economy (imports). On the other hand, the interindustry measure takes into account the direct and indirect primary inputs (capital, labour, and inputs originating outside the sector) used in domestic production. For the total business

10. W. Gullickson and M.H. Harper, "Multifactor Productivity Measurement for Two-Digit Manufacturing Industries", paper presented at the 1986 meeting of the Western Economic Association in San Francisco, July 1-5, 1986.

11. For a full discussion of the net-gross output concept of productivity, see Diaz, A. "Alternative Concepts of Output and Productivity", *Aggregate Productivity Measures 1989*, Statistics Canada, catalogue 15-204, pp. 97-106.

sector, the index based on net-gross output is equal to the interindustry index as both measures refer to the same inputs and output.

The two preceding measures are based on an approach that treats the business sector as an entity which is isolated from the rest of the economy and of the world. In this perspective, what matters is only the production delivered outside the sector and the inputs not produced by the business sector, whether they are imported or originating from other sectors (capital, labour). These measures statistically integrate the production activities within the business sector, but not with the rest of the economy or the world.

In contrast, the multifactor productivity measure based on value-added reflects the real degree of integration between the business sector and the rest of the world. From the perspective of the world economy, goods and services exchanged between countries are intermediate inputs. The fabricated inputs coming from outside the business sector (such as imports of goods and services) must not be counted in the inputs. The output therefore corresponds to the value-added of the business sector while the inputs include only capital and labour. Since the business sector is then considered as being integrated with the world economy, transactions with other parts of the world economy are deemed to be intraindustrial.

In summary, there are two measures which are relevant for the total business sector. First, there is the measure based on net-gross production and the interindustry measure which are equal, and second, there is the productivity measure based on value-added. The net-gross measure is sensitive to changes in the integration of the domestic economy with the rest of the world whereas the value-added measure is not because it already treats the inputs and outputs as if the domestic economy were completely integrated with the world economy.

2.6 - Usefulness of Productivity Indices in Economic Analysis

As indicated above, the main purpose of the multifactor productivity measures is to separate the observed growth in industrial production into increases in the economic resources employed by industries and increases in overall efficiency. This step allows a more complete accounting of the sources of economic growth than the partial measures presented in the framework of the Canadian System of National Accounts. Time series of multifactor productivity by industry also allow analysts to measure trends and detect shifts in competitive advantages among various Canadian industries vis-a-vis similar industries in the rest of the global economy. By showing how industries' evolution has been influenced by their technical performance, the assessment of multifactor productivity helps analysts and policy makers to address such issues as domestic industrial policy and international industrial strategy. Similarly, businesses and other private organizations observe productivity movements to evaluate the long-term viability of various industries and make more informed investment decisions.

In addition, proper growth accounting opens the way to a better understanding of the sources of productivity growth. The latter can be conceptually decomposed into three components: economies of scales, technical progress and measurement errors due to omitted factors. Growth accounting paves the way to further analysis of the sources of economies of scale and technical progress. Taking technical progress as an example, it could be defined as the general advance in knowledge. If we accept this definition, then, over the long run, technical progress is the only source of *permanent and sustained* improvement in productivity. Indeed, at any point in time, the level of education of workers may be raised only to a certain limit through investments in education. Similarly, the diffusion of the best known technologies through investments in physical

equipment has a limit as well as the best use of existing technical possibilities through economies of scale. Only investments in fundamental research in both human and natural sciences and investments in applied research and development can lead to a better and more educated labour force and better equipment over the very long run. Measuring the contribution of technical progress to the growth in output helps in understanding the importance of society's investment in such research.

APPENDIX 2

Sources of Data

This Appendix includes a description of data sources employed in the production of labour and multifactor productivity indices. As indicated in Appendix 1, labour productivity indices are not produced as partial multifactor productivity indices. Because both these index types are derived in part from different data sources, we describe their sources separately. More specifically, labour productivity indices are based on Laspeyres indices of Gross Domestic Product while multifactor productivity indices are calculated mainly from Törnqvist indices of gross and net-gross output. In spite of these differences, the measure of labour input, either employment or hours worked, are identical in both productivity measures.

The description of data sources is divided in two categories depending on whether data are preliminary or final. Final data are based on benchmarked data from the Input-Output Accounts as well as on statistics obtained from censuses and surveys, while preliminary data are based on other more up to date but less reliable data.

1 - Description of Labour Productivity Data

1.1 - Output

The output data used to calculate the indices of labour productivity and unit labour cost are the estimates of constant price Gross Domestic Product at factor cost by industry. The following sources are utilized: *The Input-Output Structure of the Canadian Economy in Constant Prices* (Catalogue 15-202) and *Gross Domestic Product by Industry* (Catalogue 15-001) for the years following the benchmark year. The data on real GDP in the Finance, Insurance and Real Estate Industries excludes real GDP of government royalties on natural resources and rents of owner occupied dwellings.

1.2 - Labour Input

The indices of productivity employ the number of hours worked. Hours worked are computed from the number of persons at work and the average annual hours worked. The description of sources for the employment and hours estimates applicable to the last four years are presented below[1].

1. For further details about labour input data sources, the reader is referred to *Indexes of Output Per Person Employed and Per Man-hour in Canada, Commercial Non-agricultural Industries, 1947-1963* (Catalogue 14-501) for the years 1946 to 1961 and to: Karnail S. Gill and Monique Larose, "Sources and Methods of Estimating Employment by Input-Output Industries 1961-1989", Input-Output Division, *Technical Series*, #47, 1991.

1.2.1 - Estimations of Persons at work

Persons at work. Persons at work are made up of two groups: *paid workers* and *other-than-paid workers.* The other-than-paid workers include self-employed and unpaid family workers. Up to the year of the preliminary input-output tables, the paid workers and other-than-paid workers estimates are produced at the most detailed level of the System of National Accounts. This represents employment estimates for 216 different industries, including the non-commercial sector.

Beginning in 1988, an important change has been made to the estimates of persons at work used in measures of productivity. The number of persons at work obtained as the average of the aggregation of the estimates of all industries obtained from different sources is reconciled to the employment obtained by applying the growth rate of total employment obtained from the Labour Force Survey to the 1987 employment level. The growth rate of commercial and non-commercial employment obtained from this survey also serves as annual benchmark. Any difference between the estimates is allocated between the trade industries and the Community, Business and Personal Services (excluding education and hospital industries) because employment data for these industries are considered less reliable. The same method is applied to the preliminary data described below.

Benchmark data

Paid workers. The number of paid workers including multiple job holders in agriculture, fishing and trapping industries as well as for wholesale trade, and the accommodation and food industries is taken from the *Labour Force Survey* (Catalogue 71-001).

The mining, quarrying and oil well industries are broken down into four major groups according to the 1980 SIC:

1. Mining industries;
2. Crude petroleum and natural gas industries;
3. Quarry and sand pit industries;
4. Service related to mineral extraction.

The primary data source used for the first three groups is the *General Review of the Mineral Industries*, (Catalogue 26-201). The only exception is the oil sands industry, which falls into the second major group, crude petroleum and natural gas industries. This industry is not covered in the *General Review of the Mineral Industries*, and therefore the data used for this industry are taken from the *Survey of Employment Payroll and Hours*. The last major group, service industries incidental to mineral extraction, Employment, Earnings and Hours, Catalogue 72-002 has been used.

The source of the number of paid workers in manufacturing is *Manufacturing Industries of Canada: National and Provincial Areas* (Catalogue 31-203) a publication from the annual survey of manufactures.

The publication Employment, Payroll and Hours (Catalogue 72-002) is the source for the following industries:

Logging and forestry industries;
Construction industries (contract work);
Transportation and storage industries;

Other utility industries;
Finance, insurance and real estate industries;
Business service Industries;
Educational service industries;
Health and social services industries;
Personal and other service industries;
Non-commercial services.

In transportation and storage industries the following publications were used to derive the number of paid workers: *Air Carrier Operations in Canada* (Catalogue 51-002), *Rail Transport* (Catalogue 52-212; 52-215 and 52-216), *Gas Utilities: transportation and distribution systems* (Catalogue 57-205) and *Oil Pipeline Transport* (Catalogue 55-201), *Passenger Bus and Urban Transit Statistics* (Catalogue 53-215).

In the case of the four communication industries, paid workers data were obtained from: *Radio and Television Broadcasting* (Catalogue 56-204); *Cable Television* (Catalogue 56-205), and *Canada Post Corporation Annual.*

Among the industries in the above list, the construction industry requires a clarification. The Input-Output concept of the construction industry includes the construction activity contracted out as well as the activity carried out by the work force of all other industries. The latter activity is named Own-Account Construction. Given a lack of data on the employment directly affected to own-account construction, such employment is estimated from data on labour remuneration cost obtained from Construction in Canada, (Catalogue 64-201). The volume of labour employed in this activity is obtained as the ratio between own-account construction labour compensation and the average wage in the industry where the activity takes place. These volume is subsequently transferred to the business sector construction industry. In the 1980s, own-account construction activity represented about 25% of total construction activity.

Other-Than-Paid workers. The main data source for other-than-paid workers is the Labour Force Survey. However, the number of self-employed workers, medical doctors and dentists that belong to the Health and Social Services Industries (except hospitals) are obtained from Fiscal Statistics, Revenue Canada Taxation, (Catalogue RV 44).

Preliminary data for the recent years

Preliminary data for the two most recent years are produced only at the "S" level of aggregation of the Input-Output tables. For the paid workers, the year-to-year change from *Labour Force Survey* (LFS) and *Survey of Employment Payroll and Hours* (SEPH) was applied to the absolutes values of the last benchmark year. For other-than-paid workers, the data were obtained entirely from the *Labour Force Survey.*

1.2.2 - Estimation of hours worked

Hours worked. The number of hours worked for each industry is obtained by the product between the number of persons at work and the average number of hours worked per person per year. Given the availability of employment data, the estimation of hour worked consist of estimating the average hours worked per year.

Benchmark data[2]

The estimation of average hours worked per year up to the benchmark year is made at the "PL" aggregation level, i.e., for 111 industries. With the exception of the mining and manufacturing industries, all data on average hours worked are from the Labour Force Survey.

Monthly data from the *Labour Force Survey* refer only to the survey week, usually the week falling on the 15th day of the month. Respondents having worked during the reference week are asked a series of questions on hours worked. The questions concern regular hours, overtime hours, hours effectively worked as well as hours lost and the reason for work absence. This information allows a verification of each element of the response on hours and permits the estimation of total annual hours worked. Given that the statistics refer to a precise week of the month, annual data represent only the observation of hours corresponding to 12 survey weeks during the year. To estimate the effective hours worked during the all weeks of the year, a methodology was developed in the Productivity Measurement Section[3]. The goal of the methodology is to adjust the hours effectively worked reported by the survey in relation to two factors. One is the effect of holidays falling in the reference week, the other being the effect of time lost due to labour conflicts[4].

The method used to estimate annual hours worked from data originating in the *Labour Force Survey* has four main stages:

1- The first consists of adding estimates of hours lost due to holidays or labour conflict to the estimates of hours worked during the reference week. The result is an estimate of the hours than would have been worked in the absence of conflicts and holidays. These monthly data are then interpolated in order to obtain the estimates for the 52 weeks of the year.

2- The second stage is to adjust the estimates of hours worked by the hours lost due to holidays. This information is obtained directly from the *Labour Force Survey* in the case of holidays during the survey week. Those not in the survey week are estimated. This is done by identifying and classifying the main Canadian holidays in three categories 1) Most important (Christmas, New Year, Easter Monday, Canada Day, Labour Day, Thanksgiving), b) Important (Victoria Day, Boxing Day), and 3) less important (Easter Monday, St. Jean Baptiste/Civic Holiday, Remembrance Day)[5]. The classification reflects the fact that most employees have the right to the important holidays and that a smaller proportion have the right to other holidays. The number of hours lost for the three holiday types is estimated based on those of holidays corresponding to the same category falling during the survey week.

2. For further details on hours worked data sources used to measure productivity indices for the years 1961 to 1988, see the feature article entitled "Hours Worked: A New Measure of Labour Input for Multifactor Productivity" by Jean-Pierre Maynard, *Aggregate Productivity Measures 1991,* Catalogue no. 15-204E, February 1993.
3. For a complete description of this methodology, see: Maryanne Webber, "Estimating Total Annual Hours Worked from the Canadian Labour Force Survey", Input-Output Division, *Technical Series*, #51, Statistics Canada, April 1983.
4. The employment concept of the *Labour Force Survey* includes as employees, any respondents that did not work during survey week due to labour disputes.
5. The classification of statutory holidays in order of importance comes from data collected by the Pay Research Bureau, a service of the Public Service Staff Relations Board of the Federal Public Service.

3- the third stage consists of removing hours lost due to labour conflict[6]. It must be noted that only the statistics on paid workers are adjusted for this type of absence.

4- Finally, the average annual weekly hours worked is obtained by the average weekly hours after adjustment for labour stoppage and holidays. The average number of hours worked per year is obtained as the product of the weekly average by the number of weeks in the year. This last component is not constant but follows the vagaries of the calendar. A calendar year comprises 52 full weeks plus one day (two in leap years); if any of these days fall on a non-working day, the year has exactly 52 weeks, and exceeding this in all other cases. As a result, the number of hours worked may change from year to year due to fluctuations in the length of the year.

This method permits the estimation of average hours worked for paid workers with the exception of the mining and manufacturing industries and for the other-than-paid category for all industries, except manufacturing industries.

Data for the manufacturing industries are obtained from the annual Survey of Manufactures as well as from other surveys. The calculation of hour worked by production workers is different from that of salaried workers. The number of hours worked by production workers is obtained directly from the annual Survey of Manufactures. In the case of salaried workers, the survey only collects information on normal work hours and number of vacation days. The average hours worked by this last group are obtained by deducting from normal hours the number of hours not worked due to vacations and holidays. In the case of self-employed workers it is assumed that they work the same average hours as the paid workers in the same industry.

Hours worked data for each of the four mining industries are subject to a special methodology. The estimates for metal mines, non-metal mines and sand and quarrying and sand pits are estimated on the basis of data on hours worked by production workers derived from the *Census of Mines* to which we add the average hours paid of salaried employees from the Survey *on Employment, Payroll and Hours*. The latter are adjusted by means of data on average hours of paid absence calculated as the difference between hours paid and hours worked by production workers. Average hours for the oil and gas industry are obtained directly from the *Labour Force Survey.* Average hours in mining services are obtained from data on hours paid in the *Survey of employment, Payroll and Hours* to which an adjustment is made for time lost. To reflect the total paid workers for this industry, the total hours worked of the *Labour Force Survey* at aggregation level "S" (excluding oil and gas) is used as benchmark and allocated proportional to the share of each component estimated from the different sources described above.

Preliminary data

In the case of recent years for which no *Survey of Manufactures* or *Census of Mines* data are available, we project benchmark data by the growth rate of hours worked of the *Labour Force Survey.*

1.3 - Labour Compensation

There are two components to labour compensation: labour income of paid workers and an imputed labour income of self-employed workers. The labour income of paid workers is taken

6. For more information concerning this survey, refer to *Collective Bargaining Review*, Labour Canada, monthly.

from *The Input-Output Structure of the Canadian Economy* (Catalogue 15-201), up to and including the year of preliminary tables. Data for the two most recent years are taken from *Estimates of Labour Income* (Catalogue 72-005) after adjustments are made to reroute own-account construction to construction industries of the business sector.

Labour income of other-than-paid workers. In addition to the labour income of paid workers, labour compensation includes an imputed labour income for all other-than-paid workers except unpaid family workers. The imputation is based on the assumption that the hourly income for the labour of self-employed persons is the same as that of paid worker in the same year and the same industry.

An adjustment is made in the case of some professional persons, such as doctors, dentists, lawyers, accountants and engineers. These occupations are largely self-employed, but the average earnings of paid workers in the same industry division underestimates the earnings of these occupations. In these cases their average labour income are obtained from *Taxation Statistics*, Revenue Canada Taxation, (Catalogue RV 44).

2 - Description of Multifactor Productivity Data

2.1 - Introduction

Prices and volumes for inputs and outputs used in multifactor productivity indices are based on estimates from several sources. For outputs and intermediate inputs by industry, the data are obtained from the current and constant price Canadian input-output tables[7]. Some transformation of these data are required to obtain better conceptual measures for the purpose of estimating multifactor productivity. These transformations are summarized in this appendix. Some of them were suggested by Rymes and Cas in an earlier study[8]. Primary input cost are also taken from input-output tables while their volumes are estimated from other sources. Labour input data are taken from the labour productivity program. Capital input data are described in a technical note which is summarized below[9]. The industry coverage of the business sector used for multifactor productivity estimates differ slightly from the usual definition of the national accounts as explained in more detailed in Appendix 3.

2.2 - Input-Output Commodity Data

The input-output tables are estimated at both *producers'* and *purchasers'* prices. Producers' prices are the prices received by the sellers at the boundary of their establishments. Purchasers' prices correspond to the market prices at the point of delivery and include various margins which are not taken into account in the producers' prices. Some of these margins are paid to business sector enterprises in exchange for real services such as retail and wholesale services and

7. For informations on data sources and concepts, refer to the *Input-Output Structures of the Canadian Economy, 1961-1981*, (Revised Data), Statistics Canada, Catalogue no. 15-510, Input-Output Division, 1987, pp. 1-127.

8. A. Cas and T.K. Rymes, *On Concepts and Measures of Multifactor Productivity in Canada, 1961-1980*, Cambridge University Press, 1991.

9. For a detailed documentation on capital input, see M. Salem et al. "Documentation of Capital Input and Capital Cost Time Series for Multifactor Productivity Measures",, Statistics Canada, Input-Output Division, September 1993.

transportation services. Commodity indirect tax margins, on the other hand, represent a pure transfer without any real counterpart.

As the proposed productivity measures are derived under the assumption of competitive market behaviour, it can be argued that outputs of industries should be valued at producers' prices while the inputs should be valued at purchasers' prices. The Törnqvist index of productivity growth, which is used here, rests on the assumption of profit maximizing behaviour of firms in competitive markets. This implies that the marginal product of each input be equated to its real price defined as the purchasing cost on the input including all margins divided by the net selling price of the output, excluding all margins. But as real margins represent real inputs which can be substituted for other inputs over the long run, they were considered as distinct inputs rather than included in the physical volumes of the other inputs. Tax margins were included in the input set.

Conceptually, operating subsidies can be considered as negative indirect taxes. therefore, They were distributed over the input and output commodities to which they apply. Some subsidies, however, could not be attributed to specific commodities and were treated as non-commodity indirect taxes (see below).

Royalties were considered taxes levied on industries' outputs in the productivity accounts. They were subtracted from the producers' prices of outputs to estimate the net price received by producers. Royalties are considers as a rental income on natural resources received by the business sector industry *Government Royalties on Natural Resources* in the input-output tables. However, this is an improperly defined industry for productivity analysis as it has no inputs except for the *Other Operating Surplus* which is equated to the royalties received. The industry was also excluded on the grounds that it appeared doubtful that government act as a real monopoly on natural resources industries.

Input and output volumes for goods and services were taken from producer price input-output tables without any adjustment. The reason is that in constant prices, commodity indirect taxes represent a fixed proportion of inputs calculated for the base year such that their inclusion does not affect the growth rate of volumes.

Since government goods and services cannot be substituted by other business industry supply, they are added to primary inputs. As well, unallocated import and export commodities are considered as part of primary inputs. In general, all commodities which are not produced by the business sector are considered as primary commodities. This is the case, for instance, of the postal services. However, primary inputs other than capital and labour inputs are treated as intermediate inputs in the estimates of value-added productivity.

Dummy industries have been removed from the input-output tables. Corresponding dummy commodity inputs have been transformed into real inputs on the basis of the input structure of dummy industries.

2.3 - Labour Input at Current and Constant Prices

The employment and hours estimates agree with those used in the estimates of labour productivity. Sources were described in the first part of this appendix.

Labour compensation data are also identical to those used in labour productivity. However, it is important to mention that the imputation of self-employed income is deducted from the net revenue of individual businesses in the industry in order to maintain the accounting balance of

the system. In addition, multifactor productivity labour input is weighted by the share of wages while labour productivity labour input is not weighted. Labour productivity labour input will be weighted once the labour productivity estimates will be obtained from the multifactor productivity estimates. This will recognize the heterogeneity of labour categories.

2.4 - Capital Input at Current and Constant Prices

The input of capital services for a given year is assumed to be proportional to the capital stock in constant prices at the end of the previous year, net of depreciation. Capital stock excludes investments made during the current year because, in general, they are not productive at this stage. Depreciation follows a geometric curve[10].

Two particular problems occur when using the net capital stock figures from the Investment and Capital Stock Division: first, these data are based on the 1970 SIC while the input-output tables are on the 1980 SIC; secondly, these data are estimated for industries including all establishments, not only business sector ones as is the case of the input-output tables. Capital assets for industry segments have been estimated, removed from some industries and reclassified to others so as to maximize the number of concordant industry classes. Non-business industry capital stock was estimated and removed from the industries were significant differences were known to exist, namely, in non-metal mines, chemicals and chemical products, and other utility industries.

Contrary to the estimates of intermediate and labour inputs, capital input cost is estimated residually. It corresponds to the sum of other operating surplus (that is a residual item in the input-output tables), the net revenue of unincorporated businesses less the labour income of self-employed workers. Indirect taxes other than those on goods and services are added to the cost of capital (subsidies are deducted), because these taxes apply generally to property and the use of capital by the industry. The capital service price is calculated as the ratio between capital cost and the stock of capital of the previous year in constant prices.

10. In Canada - U.S. comparisons, one must note that, in the Canadian measure of the capital stock, a more accelerated depreciation pattern is being used. For a more technical description of the new capital asset series, see *Fixed Capital Flows and Stocks, Methodology*, Investment and Capital Stock Division, Statistics Canada, May 1990.

APPENDIX 3

Aggregation Parameters for Productivity Measures

The statistics presented in this publication refer to business sector industries, as defined in the Canadian System of National Accounts. There are no corresponding statistics for non-business sector industries due to difficulties in the measurement of real output in this sector, as explained in Appendix 1.

1 - Aggregation Parameters for Labour Productivity and Related Data

The most detailed account of the business sector is defined in terms of individual industries from the *Standard Industrial Classification* (SIC). Aggregation of SIC industries generates 154 link (L) level industries (excluding the fictive industries), 47 medium (M) level industries and 13 small (S) level industries.

There are a total of 33 statistical tables on labour productivity appearing in Part 2 of this publication. Tables 1 to 4 are produced for special aggregates of business sector industries. Tables 5 to 12 correspond to selected S level business sector industries. The remaining tables, 13 to 33, are associated with the M level of the manufacturing industries.

Tables 1 and 2 show the concordance between the classification of industries in the Canadian System of National Accounts used in labour productivity and the Canadian Standard Industrial Classification.

Table 1

Concordance between "S" level industry codes, standard industrial classification codes (SIC's) and link codes

S Level Industries					
S Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
1	Agricultural & related services industries	011-017 021-023	001-0021	001-0021	1
2	Fishing & trapping industries	031-033	041-047	041-047	2
3	Logging & forestry industries	0411,0412 0511	031,039	031,039	3
4	Mining, quarrying & oil well industries	0611-0617 0619,0621- 0625,0629 063,071 081,082 091,092	051-052 057-059 061,064 071-073 079,083 087,096 098,099	051-059 061,063 066,071 073,077 079,083 087,092- 099	4-13
5	Manufacturing industries	(See M level below)			14-108
6	Construction industries	401-449	404-421	404-421	109-117
7	Transportation & storage industries	451-459 461,471 479,996 9991	501-509 512,515- 517,519 524,527	501, 502 504-509 512,519 515-517 524-527	118-128
8	Communication industries	481-483 4841	543-545 548	543-545 548	129-131
9	Other utility industries	491,492 499	572,574 579	572,574 579	132-134
10	Wholesale trade industries	501-599	602-629	602-629	135
11	Retail trade industries	601-692	10722-2611 631-699	1292,2611 631-699	136
12	Finance, insurance & real estate industries	701-705 709,711- 729,731- 733,741- 743,7499 7511,7512 759,761	7011-7016 7019,703 705,707 715,7211 7212,735 7371	702, 704 7311,7312 735,7371	137-139
13	Community, business, personal services industries	771-777 779,851- 859,861 8621,863 865,866 8671,8679 868,8691- 8693,8699 911-914 921,922 961-966 969,971 972,973 979,982 983,991- 995,9999 4842	801-809 821-827 841-845 849,851- 855,861- 864,866 867,869 871,872 874,876 877,879 881-886 891,8931 894-899	801-809 821,823- 827,851 853-859 861,862 864,866 869,871 872,874- 879,891 8931,894- 899	142-154

Table 2

Concordance between "M" level industry codes, standard industrial classification codes (SIC's) and link codes

M Level Industries - Manufacturing

M Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
8	Food industries	1011,1012 102-104 1051-1053 106,1071 1072,1081- 1083,109	101-108	101,103 105,107 111,112 123-125 128,1291 131,133 135,139	14-24
9	Beverage industries	111-114	109,145,147	141,143	25-28
10	Tobacco products industries	121,122	151,153	151,153	29
11	Rubber products industries	151-159	1623,1629	163,169	30
12	Plastic products industries	161-169	1651,27332	27332,3851	31
13	Leather & allied products industries	1711,1712 1713,1719	1624,172 174,179	161,172 174,179	32-34
14	Primary textile & textile products industries	181-183 191-193 199	181-187 189,2391	183,193 197, 201 211-216 218, 221 223, 2292 2299, 2391	35-40
15	Clothing industries	243-245 249	175, 231 2392,243- 249	175, 231 2392,242- 249	41,42
16	Wood industries	251,252 254,256 258,259	251,252 254,256 258,259	251,252 254,256 258,259	43-47
17	Furniture & fixture industries	261,264 269	2619,264 266	2619,264 266	48-50
18	Paper & allied products industries	271-273 279	271,272 2731,2732 27331,274	271,272 2731,2732 27331,274	51-54
19	Printing, publishing & allied industries	281-284	286-289 8932	286-289 8932	55,56
20	Primary metal industries	291,292 294-297,299	291,292 294-298	291,292 294-298	57-63
21	Fabricated metal products industries	301-309	301-309	301-309	64-71
22	Machinery industries	311,312 319	311,315 316	311,315 316	72-74
23	Transportation equipment industries	321,323- 329	1652,188 321,323-329	2291,321 323-329 3852	75-81
24	Electrical & electronic products	331-339	268,318 3399,331- 336,338 3391	268,318 331,332 334-339	82-89
25	Non-Metallic mineral products industries	351,352 354-359	351,352 354-359	341,343 345,347 348,351- 357,359	90-95

Table 2

Concordance between "M" level industry codes, standard industrial classification codes (SIC's) and link codes

M Level Industries - Manufacturing					
M Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
26	Refined petroleum & coal products	361,369	365,369	365,369	96
27	Chemical & chemical products industries	371-377,379	372-379	371-379	97-103
28	Other manufacturing industries	391-393 397,399	391-393 397,399	219,381-384,393 395,397-399	104-108

Special Aggregations

Industry Title	S code
Business sector industries	1-13
Business sector - goods	1-6,9
Business sector - services	7-8,10-13
Business sector - excluding agricultural & related services	2-13

2 - Aggregation Parameters for Multifactor Productivity Measures

For the purpose of deriving multifactor productivity growth rates, the inputs in goods and services were taken from the input-output tables at their most disaggregated level[1] (about 600 commodities). However, it was not possible to use the inputs or outputs by industry at their most disaggregated level (154 industries for the business sector at the link level of the input-output tables) mainly because capital stock series were not available for some industries. Input-output tables have been aggregated to a special level of aggregation -- identified as PL -- required for the multifactor productivity measures which consists of 111 business sector industries. For analytical purposes, two other aggregation levels were built: 21 industries (level PM) for the manufacturing industries and 13 industries (level PS). These levels were determined to be as close as possible to the M and S levels of industry classification of the input-output tables. With the recent addition of two industries, aggregation level PM now coincides with aggregation level M for the manufacturing industries. It is hoped that further developments of the capital database will eventually allow multifactor productivity estimates to be produced at the M and S levels of the input-output tables and that these developments will extend the PL level closer to the L level.

1. It was impossible, at this stage, to include a measure of natural resources such as land used as inputs. Natural resources are believed to be important mostly for primary industries but to play only a minor role in other industries.

The industrial coverage of the business sector departs slightly from the current definition of the Canadian System of National Accounts as some components were excluded. These are Postal Services (industry L 131), Other Utility Industries nec (industry L 134), Government Royalties on Natural Resources (industry L 140), and Owner Occupied Dwellings (industry L 141). Owner Occupied Dwellings and Government Royalties on Natural Resources were considered to be improperly defined industries for productivity analysis while capital stock data were not available for the Postal Service Industry and Other Utility Industries.

Tables 3 through 5 establish the concordance between the input-output L level and the multifactor productivity database PL, PM and PS levels of aggregation. The concordance for the PM level pertains only to manufacturing industries as industries outside this group are essentially the same as those at the PS level.

Table 3

Concordance between the PL aggregation level and the link of aggregation of industries of input-output tables

PL Level Industries					
PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
1	Agricultural & related services industries	011-017 021-023	001-0021	001-0021	1
2	Fishing & trapping industries	031-033	041-047	041-047	2
3	Logging & forestry industries	0411,0412 0511	031,039	031,039	3
4	Metal mines	0611-0617 0619	051-052 057-059	051-059	4-6
5	Non-metal mines	0621,0622- 0625,0629 063	061,071- 073,079	061,071 073,077 079	7-10
6	Crude petroleum & natural gas	071	064	063-066	11
7	Quarrying, sand pits & mining serv.	081,082 091,092	083,087 096,098,099	083,087 092,099	12-13
8	Meat & poultry products	1011-1012	1011-1012	101,103	14-15
9	Fish products industry	102	102	111	16
10	Fruit and vegetables industries	103	103	112	17
11	Dairy products industries	104	104	105,107	18
12	Feed industry	1053	106	123	19
13	Misc. food products industries	106,109 1051-1052 1081-1083	105 1081-1083 1089	124,125 131,133 135,139	20,23,24
14	Biscuit, bread & other bakery products	1071-1072	1071,10721	128,1291	21,22
15	Beverage industries	111-114	1091-1094	141,143 145,147 151,153	25-28
16	Tobacco products industries	121,122	151,153	151,153	29
17	Rubber products industries	151-159	1623,1629	163,169	30
18	Footwear industries	1712	1624,174	161,174	33
19	Plastic products industries	161-169	1651,27332	27332,3851	31
20	Leather tanneries	1711	172	172	32
21	Misc. leather & allied prod. industries	1713,1719	179	179	34
22	Man-made fibre yarn & woven cloth	181,1829	181,183	183,201	35
23	Wool yarn & woven cloth industry	1821	182	193,197	36
24	Misc. textile products industries	191,193 1991-1995 1999	184,1851 1852,1871 1872,1891- 1894,1899	211-215 218	38-39
25	Carpet, mat & rug industry	192	186	216	40
26	Clothing industries exc. hosiery	243-245 2491-2493 2495,2499	175,2392 243-249	175,2392 242-249	41
27	Broad knitted fabric industry	183	2391	2391	37

Table 3

Concordance between the PL aggregation level and the link of aggregation of industries of input-output tables

PL Level Industries					
PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
28	Hosiery industry	2494	231	231	42
29	Sawmills, planing & shingle mills	251	251	251	43
30	Veneer and plywood industries	252	252	252	44
31	Sash, door & other millwork ind.	254	254	254	45
32	Wooden box & coffin industries	256,258	256,258	256,258	46
33	Other wood industries	259	259	259	47
34	Household furniture industries	261	2619	2619	48
35	Office furniture industries	264	264	264	49
36	Other furniture & fixture ind.	269	269	266	50
37	Pulp & paper industries	271	271	271	51
38	Asphalt roofing industry	272	272	272	52
39	Paper box & bag industries	273	2731,2732 27331	2731,2732 27331	53
40	Other converted paper products ind.	279	274	274	54
41	Printing & publishing industries	281,283 284	286,288 289	286,288 289	55
42	Platemaking, typesetting & bindery	282	282	287,8932	56
43	Primary steel industries	291	291	291	57
44	Steel pipe & tube industry	292	292	292	58
45	Iron foundries	294	294	294	59
46	Non-ferrous smelting & refining ind.	295	295	295	60
47	Aluminum rolling casting, extruding	296	296	296	61
48	Copper rolling casting & extruding	297	297	297	62
49	Other metal rolling, casting etc.	299	299	298	63
50	Power boiler & struct. metal ind.	301,302	301,302	301,302	64
51	Ornamental & arch. metal prod. ind.	303	303	303	65
52	Stamped, pressed & coated metals	304	304	304	66
53	Wire and wire products industries	305	305	305	67
54	Hardware, tool & cutlery industries	306	306	306	68
55	Heating equipment industry	307	307	307	69
56	Machine shops industry	308	308	308	70
57	Other metal fabricating industries	309	309	309	71
58	Agriculture implement industry	311	311	311	72
59	Commercial refrigeration equipment	312	316	316	73
60	Other machinery & equipment ind.	319	315	315	74
61	Aircraft & aircraft parts industry	321	321	321	75

Table 3

Concordance between the PL aggregation level and the link of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
62	Motor vehicle industry	323	323	323	76
63	Truck, bus body & trailer industry	324	324	324	77
64	Motor vehicle parts & accessories	325	1652,188 325	2291,325 3852	78
65	Railroad rolling stock industry	326	326	326	79
66	Shipbuilding and repair industry	327	327	327	80
67	Misc. transportation equipment ind.	328,329	328,329	328,329	81
68	Small electrical appliance industry	331	331	331	82
69	Major appliances (elec. & non-elec.)	332	332	332	83
70	Record players, radio & tv receiver	334	334	334	84
71	Electronic equipment industries	335	335	335	85
72	Office, store & business machines	336	318	318	86
73	Communications, energy wire & cable	338	338	338	87
74	Other elect. & electronic products	333,337 3391-3399	268,333,336 3391,3399	268,336- 337,339	88-89
75	Clay products industry	351	351	351	90
76	Cement industry	352	352	341	91
77	Concrete products industry	354	354	347	92
78	Ready-mix concrete industry	355	355	348	93
79	Glass & glass products industries	356	356	356	94
80	Non-metallic mineral products n.e.c.	357-359	353,357- 359	343,345 352-355 357,359	95
81	Refined petroleum & coal products	361,369	365,369	365,369	96
82	Industrial chemicals industries n.e.c.	371	371	378	97
83	Plastic & synthetic resin industry	373	373	373	98
84	Pharmaceutical & medicine industry	374	374	374	99
85	Paint & varnish industry	375	375	375	100
86	Soap & cleaning compounds industry	376	376	376	101
87	Toilet preparations industry	377	377	377	102
88	Chemical & chemical products n.e.c.	372,379	372,379	371-372,379	103
89	Jewellery & precious metal ind.	392	392	382	104
90	Sporting goods & toy industries	393	393	393	105
91	Sign and display industry	397	397	397	106
92	Other manufacturing industries n.e.c.	391,3991- 3994,3999	391,3991- 3994,3999	381,383 384,395 398,399	107-108
93	Construction industries	401-409	404-421	404-421	109-117

Table 3

Concordance between the PL aggregation level and the link of aggregation of industries of input-output tables

PL Level Industries PL Codes	Industry Title	1980 SIC	1970 SIC	1960 SIC	Link Code
94	Air transport & services incidental	451,452	501-502	501-502	118
95	Railway transport & rel. services	453	503	506	119
96	Water transport & rel. services	454,455	504,505	504,505	120
97	Truck and other transport ind.	456,4572- 4575,4589, 4591-4592 4599996 9991	506-508 516-517, 519	507-508 516-517, 519	121,123 125-126
98	Urban transit system industry	4571	509	509	122
99	Pipeline transport industries	461	515	515	127
100	Storage & warehousing industries	471,479	524,527	524-527	128
101	Telecommunication broadcasting ind.	481	543	543	129
102	Telecommunication carriers & other	482,483	544,545	544,545	130
103	Electric power systems industry	491	572	572	132
104	Gas distribution systems industry	492	574	574	133
105	Wholesale trade industries	501-599	602-629	602-629	135
106	Retail trade industries	601-692	10722,2611 631-699	1292,2611 631-699	136
107	Finance, insurance & real est. ind.	701-705 709,711- 729,731- 733,741- 743,7499 7511,7512 759,761	7011-7016 7019,703 705-707 715,7211 7212,735 7371	702,704 7311,7312 735,7371	137-139
108	Services industries	771-777 779,911- 914,921 922,961 962,963- 969,971- 973,979 982,983 991-995 9999,4842 4581	841-845 849,851- 855,861- 864,866 867,869 871,872 874,876 877,879 881,886 891-8931 894-899 512	851,853- 859,861 862,864 866,869 871,872 874-879 891,8931 894-899 512	142-144 148-154 124
109	Educational service industries	851-859	801-809	801-809	145
110	Hospitals	861	821	821	146
111	Other health services	8621,863 865,866 8671,8679 868,8691- 8693,8699	822-827	823-827	147

Table 4

Concordance between the PS aggregation level and the input-output link aggregation level

PS Level industries			
PS Codes	Industry Title	Link Code	PL Code
1	Agricultural & related services industries	1	1
2	Fishing & trapping industries	2	2
3	Logging & forestry industries	3	3
4	Mining, quarrying & oil well industries	4-13	4-7
5	Manufacturing industries	14-108	8-92
6	Construction industries	109-117	93
7	Transportation & storage industries	118-123,125-128	94-100
8	Telecommunication industries	129,130	101,102
9	Electric power & gas dist. industries	132,133	104
10	Wholesale trade industries	135	105
11	Retail trade industries	136	106
12	Finance, insurance & real estate industries	137-139	107
13	Community, business, personal services industries	124,142-154	108-111

Table 5

Concordance between the PM aggregation level and the input-output link aggregation level

PM Level Manufacturing Industries			
PM Codes	Industry Title	Link Code	PL Code
5	Food industries	14-24	8-14
6	Beverage industries	25-28	15
7	Tobacco products industries	29	16
8	Rubber products industries	30	19
9	Plastic products industries	31	17
10	Leather & allied products industries	32-34	18,20,21
11	Primary textile & textile products industries	35-40	22-25,27
12	Clothing industries	41,42	26,28
13	Wood industries	43-47	29-33
14	Furniture & fixture industries	48-50	34-36
15	Paper & allied products industries	51-54	37-40
16	Printing, publishing & allied industries	55,56	41-42
17	Primary metal industries	57-63	43-49
18	Fabricated metal products industries	64-71	50-57
19	Machinery industries	72-74	58-60
20	Transportation equipment industries	75-81	61-67
21	Electrical & electronic products	82-89	68-74
22	Non-metallic mineral products industries	90-95	75-80
23	Refined petroleum & coal products	96	81
24	Chemical & chemical products industries	97-103	82-88
25	Other Manufacturing industries	104-108	89-92

APPENDIX 4

Quality Rating of Productivity Estimates and Related Data

This appendix provides quality ratings of labour productivity and related data and of multifactor productivity data, including the ratings of the input and output components used to estimate these measures. Quality ratings are provided for the last benchmark year as noted on the following tables. Data quality ratings for previous years may be found in preceding issues of this publication; data for the period following the benchmark year are deemed to be of lesser quality although no quality rating is provided.

1 - Quality Rating of Labour Productivity Estimates and Related Data

Like other components of the Canadian System of National Accounts (CSNA), the labour productivity and related data presented in this publication are derived from a variety of sources and subjected to various adjustments. Assessing the quality of the data thus raises difficulties similar to those pointed out in other CSNA publications. The labour productivity and related data presented in this publication are derived from:

(1) input-output tables, and real gross domestic product by industry, and,

(2) various surveys and censuses containing information on employment, hours worked, and labour income.

In rating various data our main interest lies more in year-to-year changes than in the levels of various constructs. No attempt will be made to establish a cardinal rating of there constructs used in productivity. However, based on an informed opinion, an ordinal rating will be attempted. The rank of 1 means most reliable, the rank of 2 means reliable and the rank of 3 means acceptable. Ratings are provided for the following series:

(i) Real GDP at factor cost;
(ii) Persons at work;
(iii) Average hours worked;
(iv) Hours worked;
(v) Labour compensation;
(vi) Real GDP per hour worked;
(vii) Compensation per person at work;
(viii) Compensation per hour worked;
(ix) Unit labour cost.

Real GDP. The quality ratings of real GDP have been taken from Appendix A of the publication: *The Input-Output Structure of the Canadian Economy, 1991* (Catalogue 15-201).

Persons at work. For these data, the rankings have been determined as follows: in general a rank of 1 has been assigned to the most reliable estimates that are based completely on censuses, survey or administrative records[1] with minimum adjustments for coverage, valuation and classification. A rank of 2 has been assigned to less reliable census and survey data with adjustments for coverage. A rank of 3 has been assigned to all other sources for which it has been necessary to make adjustments for classification based on professional judgement, or that are estimated from proxy indicators. It is important to note that the rating of survey series is also based on their estimated coefficient of variation. In general, the coefficient of variation is inversely proportional to the size of the industry.

Relationship between the coefficient of variation and the ordinal ratings:

Ratings	Range of coefficient of variation
1	0.0% to 2.5%
2	2.6% to 5.0%
3	5.0% and over

According to these criteria, the 1991 employment data from the Annual Survey of Manufactures at the S level of aggregation, for example, carry a ranking of 1. The main deficiency of the data comes from the fact that employment for a significant segment of employment in small businesses is estimated from Revenue Canada payroll files. Thus, a ranking of 1 has been assigned where less than 10.0% of the employment data is estimated from payroll data. A ranking of 2 has been assigned to data where more than 10.0% but less than 20.0% of the data is from this source. A ranking of 3 has been assigned above 20.0%.

In addition to being ranked according to the coefficient of variation, the data that come from the Labour Force Survey were also evaluated according to the proportion of multiple jobholders. These workers are only classified according to their primary job. It should be noted that the number of persons at work includes paid workers, self employed and unpaid family workers. Since for each industry there is at least one of the three categories estimated from the Labour Force Survey, all employment estimates are more or less affected by the classification problems of multiple job holders. A ranking of 1 has been assigned to the industry where multiple job holders represented less than 4.0% of total employment. For industries where this ratio is between 4.0% and less than 6.0%, the ranking is 2, while those where this percentage is 6.0% or greater obtained a ranking of 3. Consequently, the quality ordinal rating of employment data comes from at least two criteria[2] for all industries. The employment ratings shown in the tables of this appendix correspond to the rounded average of the assigned ratings according to the criteria described above.

Hours worked. The number of hours worked in each industry is obtained as the product of the number of persons at work and the average number of hours worked in each year. Except for manufacturing, all hours data are taken from the Labour Force Survey. As in the case of employment, the quality of average hours worked from this survey depends mainly on the estimated coefficient of variation of these series. All industries published at the S level obtained a

1. See Appendix 2 for a full description of data sources.
2. Some industries at level S are obtained through the aggregation of their subgroups at a detailed level which are composed of more then one source. Thus, the rating at S level correspond to the average weighted rating of each component.

ranking of 1, except for agriculture. For manufacturing industries at the M level, average hours worked come either from the Labour Force Survey or from the Annual Survey of Manufactures. When the source used is the Annual Survey of Manufactures, average hours worked were assigned a quality rating equal or lower than the one received by the number of persons at work. Since hours worked are obtained as the product of average hours worked and the number of persons at work, their quality rating corresponds to the rounded average of the two variables.

Labour compensation. Labour compensation is the sum of labour income of paid workers and the imputed labour income of self-employed workers. Since the estimates of labour income in the benchmark year come from administrative data and have been subjected to various Input-Output adjustments, these have a rating of one. However, in some industries (for example Agriculture, Construction, Retail Trade) there is a large number of self-employed workers for whom there is no direct measure of labour income and an imputation is made on the assumption that the hourly compensation of self-employed workers equals that of paid workers. Therefore, at aggregation level S the following rating criteria has been used. For industries, where the ratio of self-employed workers to persons at work is less than 10.0% the rating of labour compensation data is 1, where this ratio is 10.0% and 20.0% the rating is 2. For a ratio greater than 20.0% a rating of 3 has been assigned. According to these criteria, compensation data for all manufacturing industries at M level of aggregation have been assigned a quality rating of 1.

Labour productivity and *related data*. The quality ratings of ratios like real GDP per person at work, real GDP per hour worked and unit labour cost have been calculated as the rounded weighted average of the ratings for the two variables. For example, if the rating for real GDP is 1, and employment is 2, then the rating for real GDP per person at work is 2.

Table 1

Quality ratings of labour productivity and related data at aggregation level S and business sector, 1991

Industry title	Real GDP	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
Agricultural & related services industries	2	3	2	3	3	3	3	3	3
Manufacturing industries	1	1	1	1	1	1	1	1	1
Construction industries	3	2	1	2	2	2	2	2	3
Transportation & storage industries	2	2	1	2	2	2	2	2	2
Communication industries	2	1	1	1	1	2	1	1	2
Wholesale trade industries	3	2	1	1	1	2	1	1	2
Retail trade industries	3	2	1	2	2	2	2	2	3
Community, business, personal services industries	2	2	1	2	2	2	2	2	2
Business sector industries	1	1	1	1	2	1	1	1	1

Table 2

Quality ratings of labour productivity and related data for manufacturing industries at aggregation level M, 1991

Industry title	Real GDP	Persons at work	Annual hours per person	Hours worked	Labour compensation	Real GDP per hour worked	Compensation per person	Compensation per hour worked	Unit labour cost
Food industries	1	1	1	1	1	1	1	1	1
Beverage industries	2	1	2	2	1	2	1	1	2
Tobacco products industries	2	1	2	1	1	2	1	1	2
Rubber products industries	1	1	2	2	1	1	2	1	1
Plastic products industries	1	2	2	2	1	1	1	1	1
Leather & allied products ind.	1	1	3	2	1	1	1	1	1
Primary textile & textile products industries	1	2	1	2	1	1	2	1	1
Clothing industries	1	1	2	2	1	1	1	1	1
Wood industries	2	2	1	2	1	2	2	1	2
Furniture & fixture industries	1	3	2	3	1	2	2	2	1
Paper & allied products ind.	1	1	2	1	1	1	1	1	1
Printing, publishing & allied ind.	2	2	3	3	1	2	2	2	2
Primary metal industries	1	1	2	2	1	1	1	1	1
Fabricated metal products ind.	1	3	2	3	1	2	2	2	1
Machinery industries	1	2	1	2	1	1	2	1	1
Transportation equipment ind.	2	1	1	1	1	2	1	1	2
Electrical & electronic products industries	2	2	2	2	1	2	2	2	2
Non-metallic mineral products industries	1	2	1	2	1	1	2	1	1
Refined petroleum & coal products industries	2	1	2	2	1	2	1	1	2
Chemical & chemical products industries	2	1	2	2	1	2	1	1	2
Other manufacturing industries	2	3	2	3	1	2	2	2	2

2 - Quality Rating of Multifactor Productivity Estimates and Related Data

The quality rating for multifactor productivity at all levels of aggregation relies on the quality rating for gross output, intermediate inputs, capital, and labour, except for that of the business sector which depends on the quality rating for value-added, for capital, and for labour.

Intermediate inputs and gross output in current and constant prices and gross domestic product (GDP) carry the quality ratings described in Appendix A of *The Input-Output Structure of the Canadian Economy*, catalogue number 15-201. Capital input data quality is based on the ratings of business investment as given in the above mentioned publication. The quality ratings of employment, hours worked and labour compensation are discussed in section 1 of this appendix.

The quality ratings of basic data at the PS and PM aggregation levels (refer to Appendix 3 for more information on aggregation levels) are obtained by weighting the disaggregated quality ratings using value shares as weights. The quality assessment of multifactor productivity

estimates is then based on the combined quality ratings of outputs, labour inputs, capital inputs, and, if applicable, intermediate inputs, according to their respective value shares. Quality ratings of basic data shown in Tables 3 and 4 of this appendix are rounded to the nearest highest rating to account for the quality-increasing effect of aggregation.

Table 3

Quality ratings for the components of multifactor productivity estimates by industry at aggregation level PS and for the total business sector, 1991

Industry Title	Gross Output		Labour Inputs			Capital Inputs		Intermediate Inputs		GDP		MFP Index	
	C$	K$	C$	Pers.*	Hrs.**	C$	K$	C$	K$	C$	K$	Pers.*	Hrs.**
Agricultural & related services ind.	2	2	3	3	3	2	2	2	2	2	2	2	2
Manufacturing industries	1	1	1	1	1	1	2	1	1	1	1	1	1
Construction industries	1	3	2	2	2	2	3	3	3	3	3	3	3
Transportation & storage ind.	1	1	2	2	2	1	2	2	2	2	2	2	2
Telecommunication industries	1	1	1	1	1	2	2	2	2	1	2	2	1
Wholesale trade industries	1	2	1	1	1	2	2	3	3	3	3	3	2
Retail trade industries	1	2	2	2	2	2	2	3	3	3	3	3	3
Business sector industries	...	...	2	1	1	1	2	...	...	1	1	1	1

* Persons at work ** Hours worked

Table 4

Quality ratings for the components of multifactor productivity estimates by manufacturing industry at aggregation level PM, 1991

Industry Title	Gross Output		Labour Inputs			Capital Inputs		Intermediate Inputs		MFP Index	
	C$	K$	C$	Pers.*	Hrs**	C$	K$	C$	K$	Pers.*	Hrs.**
Food industries	1	1	1	1	1	1	2	1	1	1	1
Beverage industries	1	1	1	1	2	1	2	2	2	1	2
Tobacco products industries	1	1	1	1	1	1	2	2	2	1	1
Rubber products industries	1	1	1	1	2	1	2	1	1	1	1
Plastic products industries	1	1	1	2	2	1	2	1	1	1	1
Leather & allied products industries	1	1	1	1	2	1	2	1	1	1	1
Primary textile & textile products ind.	1	1	1	2	2	1	2	1	1	1	1
Clothing industries	1	1	1	1	2	1	2	1	1	1	1
Wood industries	1	1	1	2	2	1	2	1	1	2	2
Furniture & fixture industries	1	1	1	3	3	1	2	1	1	1	2
Paper & allied products industries	1	1	1	1	1	1	2	1	1	1	1
Printing, publishing & allied industries	1	2	1	2	3	1	2	2	2	2	2
Primary metal industries	1	1	1	1	2	1	3	1	1	1	1
Fabricated metal products industries	1	1	1	3	3	1	3	1	1	1	2
Machinery industries	1	1	1	2	2	1	3	1	1	1	1
Transportation equipment industries	1	1	1	1	1	1	2	2	2	2	2
Electrical & electronic products ind.	1	2	1	2	2	1	2	1	1	2	2
Non-metallic mineral products ind.	1	1	1	2	2	1	2	1	1	1	1
Refined petroleum & coal products ind.	1	1	1	1	2	1	3	2	2	2	2
Chemical & chemical products ind.	1	1	1	1	2	1	3	2	2	2	2
Other manufacturing industries	1	1	1	3	3	1	2	2	2	2	2

* Persons at work ** Hours worked

APPENDIX 5

Productivity and Related Data in CANSIM

Multifactor Productivity ***Indices since 1961***	**CANSIM Matrices**
Gross output productivity based on hours worked	7896
Net-gross output productivity based on hours worked	7897
Value-added productivity based on hours worked	7898
Interindustry productivity based on hours worked	7899
Gross output productivity based on employment	7900
Net-gross output productivity based on employment	7901
Value-added productivity based on employment	7902
Interindustry productivity based on employment	7903
Labour Productivity ***Indices since 1946***	
Persons at work	7922
Paid workers	7923
Hours worked of persons at work	7924
Hours worked of paid workers	7925
Real GDP per person at work	7926
Real GDP per person-hour worked of persons at work	7927
Labour compensation of persons at work	7934
Labour compensation per person at work	7935
Labour compensation per person-hour worked of persons at work	7936
Unit labour cost	7937
Real GDP	7938
Absolute values since 1961	
Number of persons at work	7916
Number of paid workers	7917
Number of hours worked of persons at work	7918
Number of hours worked of paid workers	7919
Real GDP per person at work	7920
Real GDP per hour worked of persons at work	7921
Average hours worked per week of persons at work	7928
Average hours worked per week of paid workers	7929
Labour compensation of persons at work	7930
Labour compensation per person at work	7931
Labour compensation per person worked of persons at work	7932
Unit labour cost	7933

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